THE GEOGRAPHICAL JOURNAL

VOLUME XCI

JANUARY TO JUNE

1938

PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL

EDITED BY THE SECRETARY

THE ROYAL GEOGRAPHICAL SOCIETY

KENSINGTON GORE LONDON S.W.7

EDWARD STANFORD LTD. 12 LONG ACRE W.C.2

AND 43 WHITEHALL S.W.1

ROYAL GEOGRAPHICAL SOCIETY

Patrons

HIS MAJESTY THE KING
HER MAJESTY QUEEN MARY

Honorary President

H.R.H. THE DUKE OF CONNAUGHT, K.G., G.C.B., G.C.S.I.

THE COUNCIL

(*Elected* 18 *October* 1937 *for the Session of* 1937–38)

President : Professor Henry Balfour, F.R.S.

Vice-Presidents

Lieut.-Col. Sir John Chancellor, G.C.M.G., G.C.V.O., D.S.O.
Colonel Sir Charles Close, K.B.E., C.B., C.M.G., F.R.S.
Vice-Admiral Sir Percy Douglas, K.C.B., C.M.G.
Admiral Sir William Goodenough, G.C.B., M.V.O.
Professor Kenneth Mason, M.C.
Lieut.-Col. Sir Francis Younghusband, K.C.S.I., K.C.I.E.

Treasurer—The Lord Plender, G.B.E.

Trustees—The Lord Biddulph ; The Most Hon. the Marquess of Zetland, G.C.S.I., G.C.I.E.

Honorary Secretaries—W. L. Sclater ; J. M. Wordie

Foreign Secretary—The Right Hon. the Lord Howard of Penrith, G.C.B., G.C.M.G., C.V.O.

Members of Council

Major R. A. Bagnold
Dr. David A. Bannerman, M.B.E.
Col. P. K. Boulnois, O.B.E., M.C.
Leonard Brooks
Air-Marshal Sir Charles Burnett, K.C.B., C.B.E., D.S.O.
Sir Harcourt Butler, G.C.S.I., G.C.I.E. (deceased)
Field-Marshal Sir Philip Chetwode, Bart., G.C.B., K.C.M.G., D.S.O.
Augustine Courtauld
Stephen L. Courtauld, M.C.
Col. H. L. Crosthwait, C.I.E.
E. H. Keeling, M.C., M.P.
Dr. T. G. Longstaff
Brigadier M. N. MacLeod, D.S.O., M.C.
The Rt. Hon. the Lord Moyne, D.S.O.
Mrs. Patrick Ness
J. M. Scott
Dr. Dudley Stamp
Lieut.-Col. E. L. Strutt, C.B.E., D.S.O.
Professor E. G. R. Taylor
Brig.-Gen. M. E. Willoughby, C.B., C.S.I., C.M.G.
Sir Ernest Wilton, K.C.M.G.

Secretary and Editor of Publications—Arthur R. Hinks, C.B.E., F.R.S.

Librarian—G. R. Crone

Map Curator—F. Allen

Bankers—Martin's Bank Ltd. (Cocks, Biddulph Branch), 16 Whitehall, S.W.1

910.5
R81.41
v.91
Ja-De 1938

CONTENTS

NO. 1 *JANUARY* 1938

THE GEOGRAPHICAL FACTOR IN MONGOL HISTORY. By OWEN LATTIMORE 1

THE CYCLOPS MOUNTAINS OF DUTCH NEW GUINEA. By L. E. CHEESMAN 21

NOTES ON THE GEOGRAPHY OF THE TUNDURU DISTRICT OF TANGANYIKA TERRITORY. By G. D. POPPLEWELL and T. E. HARCUS 31

AN UNPUBLISHED PORTOLAN CHART OF THE NEW WORLD, A.D. 1519. By RICHARD UHDEN 44

THE NYASA-SHIRE RIFT. By F. DIXEY 51

THE TURKISH–IRANIAN BOUNDARY. By G. R. C. . . 57

REVIEWS. *EUROPE:* The geography of Europe. Bucks. Northumberland and Durham. Hampshire. The face of Ireland. Georgian York. Eiszeitliche und rezente Verwitterung und Abtragung im ehemals nicht vereisten Teil Mitteleuropas. Insolation and relief. Die deutschen Kolonien in Südspanien. The Goths in the Crimea. *ASIA:* By order of the Shah. The régime of the rivers Euphrates and Tigris. Dictionary of Pāli proper names. The sunwheel. The ascent of Nanda Devi. Plant hunter's paradise. *AFRICA:* Lords of the equator. Mountains of the moon. East African plateaus and rift valleys. Moisture and farming in South Africa. South African Cinderella. Magnetic declination in South Africa (1936). *NORTH AMERICA:* The Colorado delta. Yukon yesterdays. Unflinching. *CENTRAL AND SOUTH AMERICA:* Transgressor in the tropics. My jungle trails. Peruvian pageant. Escape to the tropics. De Buenos Aires a Misiones en canoa; relato de viaje. *AUSTRALASIA AND PACIFIC:* Wonders of the Great Barrier Reef. The land that time forgot. *POLAR REGIONS:* Arctic Eskimo. *PHYSICAL AND BIOLOGICAL GEOGRAPHY:* An introduction to weather and climate. *CARTOGRAPHY:* Imago Mundi. *ECONOMIC AND HISTORICAL GEOGRAPHY:* Anthropology. The Colonial Office; a history. Edward Wilson: naturelover. Trade centers and trade routes. *GENERAL:* Sinabada . 60

THE MONTHLY RECORD: Erosion surfaces in Devon and Cornwall. The Eastern Dora Baltea basin. Rainfall and altitude in Southern Italy. A problem in Jubaland. New light on an old antarctic voyage. Columbus and the discovery of magnetic declination. The Association for the Study of Snow and Ice 89

OBITUARY: Edmund Tillotson Rich 95

MEETINGS: Session 1937–38 96

MAPS:

The Cyclops Mountains, Dutch New Guinea 23
The Tunduru District, Tanganyika Territory 32
Nyasaland 53
Turkish–Iranian boundary 58
Portolan chart of the New World . . . . *following page* 96

FIGURES:

To illustrate Owen Lattimore's paper 3
Agriculture of the Tunduru District 40

816497

A JOURNEY IN THE SALWEEN AND TSANGPO BASINS, SOUTH-EASTERN TIBET. By RONALD KAULBACK . . 97

KARAKORAM NOMENCLATURE AND REPORT. By PROFESSOR KENNETH MASON 123

TWO TRANS-SAHARAN MOTOR ROUTES. By H. E. SYMONS 153

THE DRIFT OF THE SOVIET POLAR CAMP 156

RECENT DECISIONS OF THE P.C.G.N. 158

HINTS TO TRAVELLERS: VOLUME II 160

REVIEWS. *EUROPE:* International soil map of Europe. The British Isles. The pastoral heritage of Britain. River flow records of the Ness basin (Inverness-shire). In Breckland wilds. Boadicea. My own queer country. Scandinavian archaeology. Glazial-morphologische Untersuchungen auf Lofoten und Vesteraalen. Scratch a Russian. Watch Czechoslovakia! Dead puppets dance. *ASIA:* Across Cyprus. French Indo-China. Towards Angkor. The heart of a continent. Forbidden journey. Crisis in China. *AFRICA:* Religion and medicine of the Gã people. Aspects de végétation des Parcs Nationaux du Congo Belge. Exploration du Parc National Albert. Les Parcs Nationaux et la protection de la nature. Animal treasure. Snow on the equator. Mapungubwe. Big game hunting and adventure. *NORTH AMERICA:* I primi esploratori dell' America. Unser Amerika. Amerikas Schicksalsstunde. Stepping stones from Alaska to Asia. *CENTRAL AND SOUTH AMERICA:* Journal of a cruise to the Pacific Ocean, 1842–1844. Mosquito coast. *AUSTRALASIA AND PACIFIC:* Religion and social organization in Central Polynesia. The black musketeers. *POLAR REGIONS:* The Arctic whalers. *PHYSICAL AND BIOLOGICAL GEOGRAPHY:* An introduction to historical geology. *ECONOMIC AND HISTORICAL GEOGRAPHY:* Professor David. *GENERAL:* Small yacht cruising 163

THE MONTHLY RECORD: King George the Sixth Sound. Geology of Mimms valley, Hertfordshire. Glaciation of Siberia. The headwaters of the South Nahanni River, N.W.T. Basaltic barriers of Western Victoria. Geographical results of the Second Byrd Antarctic Expedition. British Trans-Greenland Expedition, 1934: altitudes. Oxford University Exploration Club. Geographical bibliographies 192

OBITUARY: Major-General Lord Edward Gleichen. George Philip. Mrs. W. E. Oates. Walter J. Clutterbuck 198

MEETINGS: Session 1937–38 200

MAPS:

Sketch-map of the Salween and Tsangpo basins 101
The Karakoram 124
Drift of the Soviet North Polar Camp 157
The Salween and Tsangpo basins, south-eastern Tibet *following page* 200

THROUGH THE UNEXPLORED MOUNTAINS OF THE ASSAM–BURMA BORDER. By CHRISTOPH VON FÜRER-HAIMENDORF, D.PH. 201

POPULATION CHANGES IN THE COLLIERY DISTRICTS OF NORTHUMBERLAND AND DURHAM. By ARTHUR E. SMAILES 220

ACROSS THE GREAT MAKARIKARI SALT LAKE. By SIR BEDE CLIFFORD 233

THE ORIGIN OF RODDONS. By H. GODWIN 241

THE OLD ENGLISH MILE AND THE GALLIC LEAGUE. By G. B. GRUNDY 251

THE ORIGIN OF THE NAME ANTILLIA. By G. R. CRONE . 260

LOPO HOMEM AND THE MILLER ATLAS OF 1519 . . 263

REVIEWS. *EUROPE:* The place-names of the East Riding of Yorkshire and York. Die Küste der englischen Schichtstufenlandschaft. The coloured counties. Beiträge zur Geologie der westlichen Mediterrangebiete. The melting pot. Wine-dark seas. Lapland. *ASIA:* Ancient Cyprus: its art and archaeology. Baghdad sketches. Everest: the unfinished adventure. The invasion of China by the Western World. *AFRICA:* Present-day Morocco. Histoire des populations du Soudan central (Colonie du Niger). A short history of Nigeria. European beginnings in West Africa, 1454–1578. The useful plants of west tropical Africa. *NORTH AMERICA:* Historic spots in California. The American people. *CENTRAL AND SOUTH AMERICA:* The geology and biology of the San Carlos mountains, Tamaulipas, Mexico. La famille Otomi-Pame du Mexique central. Coclé: an archaeological study of central Panama. *AUSTRALASIA AND PACIFIC:* Antipodean journey. *POLAR REGIONS:* Exploring with Byrd: episodes from an adventurous life. *PHYSICAL AND BIOLOGICAL GEOGRAPHY:* Allgemeine Erdkunde. Outlines of historical geology. Lehrbuch der Meteorologie. Deutsche Atlantische Expedition auf dem Forschungs- und Vermessungsschiff "Meteor" . . . 1925–1927. *ECONOMIC AND HISTORICAL GEOGRAPHY:* Limits of land settlement. *GENERAL:* Lehrbuch der organischen Geographie 267

THE MONTHLY RECORD: Award of the Geographical Essay Prize. Publications of the Organizing Committee of the XVIIth International Geological Congress, Moscow, 1937. Hydrography of Norwegian fjords. The geology of northern Central Africa. A problem in Jubaland. Meteorology of French West Africa. The Bosumtwi caldera. Land utilization in Tasmania. Slope and soil erosion. Terrestrial and celestial globes by Willem Blaeu . . 290

MEETINGS: Session 1937–38 296

MAPS:

The Naga Hills . . . . . *facing page* 204
The Makarikari region 234
The colliery districts of Northumberland and Durham *following page* 296

FIGURES:

To illustrate A. E. Smailes' paper 225, 228
To illustrate H. Godwin's paper 244, 246, 248

BRITISH GRAHAM LAND EXPEDITION, 1934–37. By J. R. RYMILL. Part I 297

THE SHAKSGAM EXPEDITION, 1937. By ERIC SHIPTON . . . 313

A LOCAL EXAMPLE OF THE FACTORS INFLUENCING INDUSTRIAL LOCATION. By E. CHARLESWORTH 340

APPLICATION OF GEOPHYSICAL METHODS TO THE STUDY OF THE GREAT BARRIER REEFS. By PROFESSOR H. C. RICHARDS 352

THE SAHARA 354

VOYAGES OF MARTIN FROBISHER. Review by E. G. R. T. . 360

REVIEWS. *EUROPE:* The middle level of the Fens and its reclamation. The green hills of England. Cotswold days. France. Mountain days in the Highlands and Alps. La Bretagne. To meet the spring. Russian mediaeval architecture. *ASIA:* Forschungen in Inneranatolien. 'Iraq. India. The land of the Gurkhas. Social and physical anthropology of the Nāyādis of Malabar. *AFRICA:* Il Sàhara italiano. The birds of British Somaliland and the Gulf of Aden. The Gold Coast, yesterday and to-day. Mining and metallurgy in negro Africa. *NORTH AMERICA:* The cartography of the northwest coast of America to the year 1800. The book of birds. *CENTRAL AND SOUTH AMERICA:* Der Balkan Amerikas. Oceanic birds of South America. *AUSTRALASIA AND PACIFIC:* I find Australia. Flying fox and drifting sand. A gold seeker's odyssey. Wide horizons. Two lugs on a lugger. *POLAR REGIONS:* Under the Pole Star. Atlas over antarktis og sydishavet. Innenfor drivisen. *PHYSICAL AND BIOLOGICAL GEOGRAPHY:* Quatrième Rapport de la Commission pour l'Étude des Terrasses Pliocènes et Pléistocènes. Die Vereisungskurve. Ecological animal geography. International aspects of oceanography, oceanographic data and provisions for oceanographic research. Étude pratique des rayonnements, solaire, atmosphérique et terrestre. The magneto-theodolite. *ECONOMIC AND HISTORICAL GEOGRAPHY:* Eine Bonitierung der Erde auf landwirtschaftlicher und bodenkundlicher Grundlage. The rationalization and conservation of the timber resources of the world. L'oeuvre géographique de Linant de Bellefonds. Storia letteraria delle scoperte geografiche. A history of geographical discovery and exploration. Pythéas le Massaliote. Damien the leper. *GENERAL:* Natural regions. Cruise of the *Conrad*. Escape on skis 364

THE MONTHLY RECORD: Alpine tunnel meteorology. Vatnajökull: Swedish-Icelandic investigations, 1936–7. King Christian X and science. The badge of the Consulate guard in Kashgar. Reported find of Norse relics in Ontario. Discovery of a lake in Dutch New Guinea. The beacon lamp of the Danish Geodetic Institute. A Dutch version of Saxton's map of England. The Newbigin Prize . 394

OBITUARY: Colonel Sir W. Coote Hedley, K.B.E., C.B., C.M.G., late R.E. 399

MEETINGS: Session 1937–38 400

MAPS:

To illustrate J. R. Rymill's paper 298, 299
The Biafo and Braldu glaciers 324
To illustrate E. Charlesworth's paper 341
Graham Land Coast . . . . . *following page* 400
Parts of the Great Karakoram and of the Aghil Mountains *following page* 400

DESICCATION AND THE WEST AFRICAN COLONIES. By BRYNMOR JONES 401

BRITISH GRAHAM LAND EXPEDITION, 1934–37. By J. R. RYMILL. Part II 424

THE POPULATION OF TURKEY IN 1935. By A. A. PALLIS . . 439

SOME NOTES ON PART OF THE GWEMBE VALLEY IN NORTHERN RHODESIA. By F. B. MACRAE 446

THE LOPO HOMEM MAP ONCE MORE. By F. A. KAMMERER . 450

THE TEES-SIDE IRON AND STEEL INDUSTRY. By J. T. GLEAVE 454

NEW MALTESE ORTHOGRAPHY 468

REGIONAL DIVISIONS IN CATALONIA. Review by E. H. G. D. 468

REVIEWS. *EUROPE:* The scenery of England and Wales. Cotswold country. The chorography of Norfolk. Scotland's shifting population, 1770–1850. Cook's traveller's handbook to Paris. Vienna. Die Entstehung der Ostsee. Neugriechenland. *ASIA:* Escape from Baghdad. A handbook for travellers in India, Burma and Ceylon. Himalayan campaign. Journey to Turkistan. Das Bergland der nordwestlichen Mandschurei. The Philippines. *AFRICA:* Arthur Rimbaud in Abyssinia. Felsmalereien in Innerafrika. Der Kulturanteil des Deutschtums am Aufbau des Burenvolkes. The soils, vegetation, and agricultural systems of northwestern Rhodesia. *NORTH AMERICA:* After big game in the Upper Yukon. *CENTRAL AND SOUTH AMERICA:* The Republics of South America. Notes on a drum. *POLAR REGIONS:* Arctic harpooner. *PHYSICAL AND BIOLOGICAL GEOGRAPHY:* Mother Earth. World natural history. *ECONOMIC AND HISTORICAL GEOGRAPHY:* Marco Polo. William Tyrrell of Weston. *GENERAL:* These are real people . 471

THE MONTHLY RECORD: Meteorite craters of Kaalijärv, Estonia. A recent journey in the Rub' al Khali. Geology and archaeology of the Vaal river basin. Rock-fracture by lightning in California. Norwegian work in the Arctic. Selective sorting of sand grains by wind. The Wolfenbüttel portolan. Nicholas Miklouho-Maclay. Royal Empire Society Library 490

MEETINGS: Session 1937–38 496

MAPS:

Nigeria and the French Niger Colony 404
Southern base, Marguerite Bay . . . . . *facing page* 432
Graham Land 1934–37 . . . . . *facing page* 434
Administrative divisions in Turkey 440
The Gwembe valley, Northern Rhodesia 448
Graham Land. B. G. L. E. 1935–37 . . . *following page* 496

FIGURES:

To illustrate J. T. Gleave's paper 456–66

LHASA IN 1937. By F. SPENCER CHAPMAN 497

NOTES ON THE SCIENTIFIC WORK OF THE BRITISH GRAHAM LAND EXPEDITION, 1934–37. By REV. W. L. S. FLEMING, A. STEPHENSON, B. B. ROBERTS, and G. C. L. BERTRAM . 508

THE PERCY SLADEN EXPEDITION TO LAKE TITICACA, 1937. By H. CARY GILSON 533

DRAKE'S PLATE OF BRASS. By J. A. WILLIAMSON . . . 543

REVIEWS. *EUROPE:* The inner gate. A history of Richmond Park. Wharfedale. L'évolution morphologique du bassin de l'Ardèche. Geographische Landeskunde Westfalens. Österreichische Vaterlandskunde, für die achte Klasse der Mittelschulen. Profane pilgrimage. Das Land Kamâl Atatürks. Turkey in pictures. *ASIA:* Jungle trails in northern India. Excavations at Tepe Hissar, Damghan. Kafirs and glaciers. Geology of Siberia. Kühles Grasland Mongolei. China's first missionaries. *AFRICA:* Law and authority in a Nigerian tribe. The voyages of Cadamosto. Le routier de Dom Joam de Castro. Monumenta cartographica Africae et Aegypti. The drama of Madagascar. The phonetics of the Hottentot language. African mirage. *CENTRAL AND SOUTH AMERICA:* Handbook of Latin American studies. *AUSTRALASIA AND PACIFIC:* Australia's empty spaces. *POLAR REGIONS:* South latitude. *PHYSICAL AND BIOLOGICAL GEOGRAPHY:* Die Anwendung der Stereophotogrammetrie bei den Alpenvereinskarten. Bestimmung des Schwereunterschiedes Helsinki-Potsdam im Jahre 1935 und Katalog der Finnischen Schwerestationen. The measurement of gravity at sea. Second order disturbance terms in pendulum observations at sea. The Gravity Expedition of H.M. Submarine O.16 in the North Atlantic, January 11–March 16, 1937. The determination of the earth's plasticity from the postglacial uplift of Scandinavia: isostatic adjustment. *ECONOMIC AND HISTORICAL GEOGRAPHY:* An introduction to physical anthropology. Humphrey Lhuyd's maps of England and Wales. Questões historico-coloniais. Orientations. Son of the mountains. Letters to Ceylon 1814–1824. *GENERAL:* Regionale Geologie der Erde. The Kingsway social geographies . 546

THE MONTHLY RECORD: Journal of geomorphology. Catalonia. The Swiss föhn wind. The structure of the Himalayas. Exploration of the Salween valley. An introduction to regional survey in Queensland 571

OBITUARY: Melville William Hilton-Simpson 575

MEETINGS: Session 1937–38 576

MAPS:

Lake Titicaca . . . . . *facing page* 534
Northern base, Argentine Islands . . . . *following page* 576

The
GEOGRAPHICAL JOURNAL

Vol XCI No 1 R.G.S. *January 1938*

THE GEOGRAPHICAL FACTOR IN MONGOL HISTORY

OWEN LATTIMORE

Evening Meeting of the Society, 14 December 1936

FROM ancient times the most accepted writers have considered the life of the steppe nomads of the old world to be as changeless as it is barbarous. This may be described as the classical view. It has been elaborated, without being really changed, by those geographical determinists who believe that primitive human society is controlled rigidly by its environment. Proceeding from this assumption, they describe both the occasional overrunning of settled lands by nomads and the occasional advance of settlers into nomad territory as "waves," which are caused by variation, notably climatic variation, in the geographical environment.

More recently, this classical view and its geographical explanation have been modified by writers who believe that human society is capable of modifying its geographical environment. Both the cultivation of marginal areas and the overgrazing of stock in true steppe areas can ruin the soil, create deserts and "change the climate." This may be called a semi-classical view.

My own opinion is that the relation of history to geography is much more complicated; that steppe society has been modified by both evolution and devolution, and also by shifts between extremely extensive forms of economy and relatively intensive forms. I believe that while the environment strongly conditions a primitive society, it does not always make social evolution impossible. Moreover society, as it evolves, attempts to exercise choice and initiative in the use of the environment. Consequently, marginal environments and marginal societies, permitting initiative of this kind, are of special importance in studying the way in which historical movements are generated. In attempting to establish this opinion, I shall first review the classical concepts and their modern variants, and in so doing set out the grounds which, I think, justify my own concept.

In his encyclopaedic 'Study of history' Mr. Arnold Toynbee made a notable attempt to survey all the geographical factors in the history of nomadic peoples in the whole steppe zone of the old world, from North Africa across

Arabia to the Persian Gulf, and from the Caspian to China.[1] Except for his greater emphasis on climate, and especially climatic variation, his findings reaffirm and elaborate, with great learning, an understanding of nomadic life and history that is well established. For this reason his work makes an excellent starting point for an attempt to reveal certain shortcomings that are inherent in the orthodox or classical view, and to press on toward an understanding of wider scope and greater depth. I shall here deal only with Mongol history and the geography of Mongolia; but the conclusions that can be reached from a study of the Mongol people in the setting of Mongolian geography can be applied with only minor modifications to all the steppe nomads of the old world.

The geographical environment of the steppe is compared by Toynbee to the sea; human use of it demands continual movement. This means that the people of the steppe must, to use Toynbee's term, accept a "challenge" and make themselves masters of a highly specialized way of life. He goes on to the conclusion that the steppe nomads were so successful in doing this that they incurred the "penalty" of becoming "the perpetual prisoners of an annual climatic and vegetational cycle." Their society became so rigidly specialized that it ceased to have "any inner evolution." The history of nomadic peoples came in consequence to be guided mechanically. At times they were "pushed off" the steppe by climatic change (increased aridity); at other times they were "pulled out" of the steppe by the "breakdown and disintegration" of sedentary civilizations, which tempted them to raid and conquer.

Both kinds of mechanical agency might cause migrations, but neither could result in evolution or change in the character of nomadic life itself, which remained so rigidly specialized that nomads who conquered settled peoples could not adapt themselves to a changed or mixed way of life. They were therefore absorbed by the peoples they conquered. When, like the Osmanli Turks, they survived for a time, it was only by the pseudo-adaptation of "turning themselves from shepherds of sheep into shepherds of men."

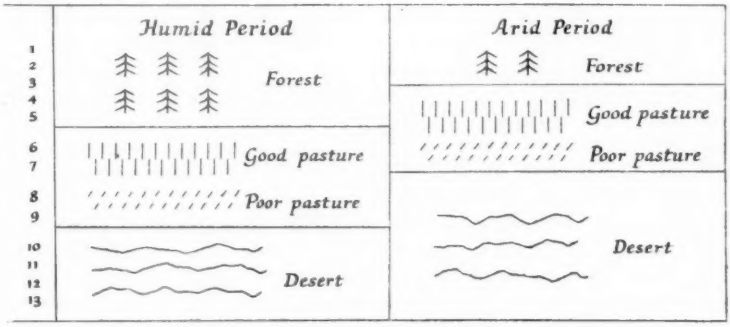
Toynbee develops the theory of climatic variation in great detail. He provides a chronology of the alternating encroachment of nomads on settled lands (to be explained by periods of aridity) and of settled peoples on the nomad steppes (to be explained by periods of increased rainfall). Among what he considers the direct correspondences between desiccation and nomadic "eruption" is a "paroxysm" of aridity in Central Asia in the thirteenth century, coinciding with the Mongol unrest out of which Chingghis Khan arose. This was followed at the beginning of the fourteenth century by a "physiographical recoil towards humidity," which "likewise corresponds in date with the rapid ebb of the Mongols." He makes allowance also for the fact that the nomadic people which attacked a settled country may not always have been set in migration by aridity in its own pastures. It may have been attacked by some other tribe, whose pastures had dried up, and thus have

[1] 'A study of history,' by Arnold J. Toynbee. London, 1934 (first three volumes). See especially vol. III, "The Nomads," pp. 7–22; "The Osmanlis" (an acute study of the transition of nomads to empire over settled peoples), pp. 22–50; and Annex II, on the causes of "Nomad eruptions," pp. 395–454.

been startled or pushed into a migration which it would not otherwise have attempted.

These assumptions, reasonable enough in themselves, make it possible to account for almost any migration in history, since the lack of any immediate and obvious climatic explanation can always be attributed to the time lag between aridity in one place and the appearance of nomad invaders at some quite distant point, a good many years later. Such assumptions are tempting and dangerous. Our knowledge of the details of many nomadic movements in the past is not sufficiently exact. By piling one assumption on another it is possible to tabulate the history of successive migrations in a manner that looks astonishingly accurate and convincing. It is well to remember therefore that the results which look so solid are based largely not only on a chain of speculative causes and assumed effects, but often on original details which are much too fragmentary to carry so solid a superstructure.

Toynbee prints a note by G. F. Hudson, pointing out some of the weaknesses of the climatic theory, when it is taken unmodified and accepted as all-explanatory. Hudson provides an excellent diagram which makes it clear that periods of aridity, resulting in a south-to-north shift of climatic belts in the zone between the Gobi on the south and Siberia on the north, need not result in a serious decrease in the amount of pasture available for a steppe nomad society.



The shift of climatic belts resulting from a period of aridity on the Eurasian steppe

Hudson concludes that there is no doubt that there have been oscillations of climate and that they have been factors in the eruptions of nomads, but that the "push" of climate and the "pull" of settled lands ready to be raided do not explain everything. He thinks that there is a measure of real development in nomadic societies, and mentions as factors contributing to development the mixture of nomadic and sedentary societies and the growth of commerce.[1]

This is a step away from the excessively mechanical understanding of the geographical factor in history, and a step towards the more reasoned study of society as it functions in a geographical environment. The approach can be

[1] G. F. Hudson, in Toynbee, *op. cit.*, vol. III, pp. 453–4. Diagram reproduced by courtesy of Mr. Toynbee, the Royal Institute of International Affairs, and the Oxford University Press.

advanced another step by reference to the recently fashionable theory of the effect of human society on geographical environment. The spectacular development of a huge dust-bowl in Western America and Canada has made the phenomenon of "man-made deserts" so popular that it is even being used in attempts to override theories of desiccation in regions that are old favourites of those who believe in "climatic pulsation." [1]

This kind of human influence, like natural climate and natural climatic variation, is in fact important, though its proper significance is also in danger of being exaggerated. Along the southern edge of Inner Mongolia, colonized by Chinese in successive stages within the last two or three generations, great areas have been laid waste by the practice of agriculture on too thin a soil.[2] The destruction is likely to be greatest where the rainfall is most variable, because too much rain washes away the soil exposed by ploughing, and lack of rain leaves a thin, dry soil to be blown away. At the same time, in a large part of the Mongol lands adjoining the zone of colonization, the restriction of grazing grounds resulting from loss of part of the old tribal pastures has led to over-grazing. This also destroys the grass-cover and exposes the topsoil, bringing on desert conditions.

Over-grazing carries another penalty. The pasture becomes stale, sour, and less nourishing, and the cattle grow poorer and more subject to disease. In parts of Chahar and Suiyüan provinces I have myself seen a most curious phenomenon: the deterioration of the pastoral economy of the Chahar Mongols and some of the Olanchab League Mongols, as a result of their being cramped within too narrow grazing grounds, and at the same time, in the old Mongol lands now colonized by Chinese, agriculture beginning to decline as the relatively thin soil is exhausted. Yet, on the stubble and on the fallow of the colonized belt, cattle are being grazed in increasing numbers, and they are better in quality than the Mongol cattle, and not so subject to disease. This is partly because the land, through being rested from the use of cattle for a while, has become cleaner and better for grazing at the same time that it has deteriorated for agricultural use. It is also partly because the lands colonized by the Chinese are just those lands which were formerly the best winter pastures of the Mongols. It is the condition in which livestock come through the winter and face the critical season in which they bear their young that largely determines the prosperity of a nomadic pastoral economy.

Were it not for the operation of economic and political factors (of which railways and modern firearms are probably the most obvious), differing from anything in the previous history of the region, it would be possible to predict that many of the Chinese colonists would eventually convert themselves, as a result of the failure of their agriculture, into a pastoral people, and would finally, in order to give their pastures the necessary seasonal rotation in use, adopt a migration-cycle, thus becoming nomads and assimilating their society to that of the older nomads. Things like this have happened in the past all along the Mongol–Chinese border. Not only have Chinese "turned Mongol," but Mongols have "turned Chinese," and this process is still going on, notably

[1] W. J. Lowdermilk, "Man-made deserts," *Pacific Affairs*, vol. VIII, No. 4, December 1935.

[2] James Thorp, "Colonization possibilities of North-west China and Inner Mongolia," *Pacific Affairs*, vol. VIII, No. 4, December 1935.

(*Courtesy of the Hermitage Museum, Leningrad*)

Reindeer mask for horse, from Pazyryk tomb, Eastern Altai

Top of tent used by Torgot Mongols being set up as a temporary shelter

Trellis work which forms the bottom part of the Mongol tent; conical roof of framework being added

Adding the felt coverings to the framework of the tent

in parts of the Ordos region, among the Tumets of Suiyüan and the Tumets and Kharchins of Jehol.[1] Changes between different forms of the nomadic life are also known; there are Mongols that have become Tibetanized, while in the Altai, in the north-west of Outer Mongolia, there are tribes of Turkic stock who have changed from forest nomadism to pastoral nomadism and in the process have been Mongolized.[2]

It is plain that neither natural climatic change nor changes wrought in the geographical environment by human activity can be ignored. On the other hand, it should not be forgotten that geography is merely the framework within which history takes place, even though history may alter the framework here and there. The study of geography should not be distorted in the attempt to make it explain the whole of any historical process. The only sound approach is through study of the way a society functions in its geographical setting. It is necessary in the first place to realize that although the history of the Mongolian and Central Asian steppe zone, from Siberia in the north to China on the south, and from Manchuria in the east to Turkistan and South Russia in the west, is dominated by the pastoral nomad peoples, it is not monopolized by them. The history of the steppe peoples is not independent of the history of forest hunters and the history of agricultural communities. The plough has never been wholly exiled from Turkistan, the land of oases and deserts, and there are good lands in the north of Outer Mongolia where agriculture has flourished at different periods, though not continuously.

Moreover, archaeological evidence carries far back into the past the record of alternation between the three ways of life that are important in the history of the steppe region and its fringes—hunting, cattle-breeding, and agriculture. In considering this alternation, the bias toward a crude reliance on geographical environment is not the only thing that hinders a clear understanding. It is necessary also to dispose of the idea, still tenaciously held by many Chinese and Western writers, that the evolution of society proceeds always and inevitably from a hunting economy to a pastoral economy, then to agriculture and then to "modern civilization."

Toynbee provides evidence for disproving this assumption. He proves that the sequence of change is not invariable, although at the same time he retains his belief in climatic variation as the cause of change. Citing the discoveries of the Pumpelly expedition, he asserts emphatically that nomad pastoralism is not necessarily a more "primitive" way of life than agriculture. The stratification of certain archaeological sites in Central Asia establishes the fact that sometimes agriculture has preceded pastoralism.[3] As a matter of fact, the Pumpelly finds do not provide the only evidence of the kind, but

[1] 'The Mongols of Manchuria,' by Owen Lattimore. New York, 1934; London, 1935. See especially under "Kharchins" and "Manchu-Mongols."

[2] 'Social structure of the Mongols: Mongol nomadic feudalism,' by B. Ya. Vladimirtsov. Leningrad, 1934, p. 149. Also Ney Elias, "Narrative of a journey through Western Mongolia, July 1872 to January 1873," *Geogr. J.* 43 (1873) 108–55.

[3] 'Explorations in Turkestan: Expedition of 1904: Prehistoric civilizations of Anau,' by R. W. Pumpelly. Washington, 1908. (Carnegie Institution, Publication No. 73.) See especially the contribution by J. U. Duerst, on animal bones, animal domestication, etc., vol. II, p. 438.

they are of particular importance because of their early date; the change from agriculture to pastoralism being attributed, by Pumpelly and his associate, J. U. Duerst, to the eighth millennium B.C.

If it is to be accepted that peoples change from agriculture to nomadic cattle breeding, and from pastoralism to hunting, as well as from hunting to cattle breeding and from cattle breeding to agriculture; and if it is true also that changes in the environment are not necessarily the sole cause or even the most important cause of social change, then what are the true standards by which differences in the economic organization of society can be rated, and what are the causes and processes of change?

I suggest that the standard of differentiation between economic forms is not evolutionary but economic. There is not necessarily a historical sequence from hunting to pastoralism and from pastoralism to agriculture; but these three forms do range through a significant economic scale. The economy of hunting is extensive. Hunting peoples need to spread out over a wide territory. They live therefore in small groups, and though families living and hunting at a distance from each other may belong to the same tribe, it is not possible for them to assemble together for long at a time. It is difficult to base a strong tribal organization, much less concerted political action, on a population so thinly scattered.

The economy of pastoralism is also extensive, but not so extensive as that of hunting. The degree of extensiveness varies according to the kind of livestock and the richness of the pasture, but in any case the tribal cohesion can be greater than that of hunting peoples, and a stronger political grouping is possible. Agriculture, even at its crudest, is much more intensive than any herdsman's economy, and permits closer and larger groupings of people; and irrigated agriculture, especially in oases, is a highly intensive economic form. Movement along the scale from the extreme of extensiveness to the extreme of intensiveness should not however be confused with progress from the primitive to the civilized. Historically, there may be devolution from the intensive to the extensive as well as evolution from the extensive to the intensive; and in degree of culture a mature and flourishing pastoral society may stand higher than a society that is bound down to a primitive or debased agriculture.

As for the process of transition from one form to another, I suggest that it may be either stimulated or impeded by the environment. From this it follows that changes in the environment may affect the bias toward or against social transition; but the most important momentum of change, I suggest, is to be looked for in the society itself. This momentum depends largely on the balance between the society and its environment, which may be described in terms of action and reaction. The original form of a society is likely to be strongly conditioned by the environment; but as the society develops, it is likely to react by attempting to choose the way in which it uses the environment. This is where the question of balance comes in, which I believe to be of acute importance in judging the interaction of geography and history. In a terrain where there is not enough to hunt and not enough running water or rainfall to permit agriculture, steppe nomads may live in perfect or almost perfect balance with the environment, their society generating relatively

The tent dismantled for transport

The maikhan: possibly the original steppe-tent

Primitive hut tent, common only in sandy regions where willow scrub is plentiful

Camel carts used in the east of Outer and Inner Mongolia. The hooded cart can be used as a sleeping place

The Mongolian steppe: Sanctuary of Chingghis, Ordos

Tent mounted on a cart, in the ancient style, at the Sanctuary of Chingghis

little impulse toward change. If however the terrain permits both hunting and cattle breeding, or both cattle breeding and agriculture, the balance is not perfect. The people living in the territory may have mixed interests. Their history is likely to develop a bias toward one or another alternative form of development, as the result of attempts to exercise a choice in the use of the environment. The bias may also vary at different historical periods, as the result of extremely complicated adjustments and readjustments between the range of possibilities afforded by the environment and the range of choice favoured by different groups within the society.

These considerations are of the very greatest importance in dealing with the geographical factor in the history of a region like Mongolia. They suggest that the sources of movement and change in the history of steppe nomads are not to be looked for among the typical nomads of the typical steppe so much as among the marginal societies of marginal regions.[1] They make unnecessary the romantic explanation of hordes of erratic nomads, ready to start for lost horizons at the joggle of a barometer, in search of suddenly vanishing pastures. "Marvellous indeed," in the words of Ralph Fox, "must have been the appetites of those few thousand head of horses and sheep that had to roam from Baikal to the plains of Hungary before they found satisfaction." For, as Fox goes on to say, "in historic times there has been no great desiccation of middle and High Asia, and to explain the great invasions we must look for the cause in the life of these peoples itself, in that history which is supposed not to exist."[2]

Suppose we look afresh at the Mongolian and Central Asian steppe zone as a whole. While the steppe is the dominant feature, the geographical range includes or borders on forested mountains and deserts of sand and gravel, rich pasture lands and even richer areas of irrigated agriculture. The peoples who take part in the history of the steppe, far from conforming to a single, unvarying nomadic-pastoral type, are divided from each other by different economic activities and gathered together in a number of different kinds of political grouping. There is no need to restrict historical analysis to a supposedly limited evolutionary scale of hunting, pastoralism and oasis agriculture. We see that on the flanks of the main body of steppe society there formed, in the course of centuries, an almost infinite series of combinations of steppe-nomadic, hunting, agricultural, and town life—some of which penetrated far into terrain that we normally think of as unmodified steppe. We see individuals, family groups, tribes, and whole peoples changing their way of life, or bringing under political control other groups with either a similar or a different way of life, or building complicated political structures in which were combined the trade, tribute, and military power of hunting peoples, true steppe nomads, oasis peoples, and the agricultural communities which flourished at times, though never permanently, even in regions like Northern Mongolia.

Against this background it becomes plain that the interaction of nomad society and such old and solid civilizations as those of China and Persia was

[1] Owen Lattimore, "Social geography of the Great Wall of China," *Geographical Review*, vol. XXVII, No. 3, October 1937.

[2] 'Genghis Khan,' by Ralph Fox. New York, 1936, p. 37.

not abnormal, even when it took the form of conquest. The changes that were effected by conquest were inherent in the unending struggle for balance and adjustment between different economic interests, different social groups and different political combinations; but in time of conquest the rate of change was precipitate instead of fluctuating.

The processes of change are illustrated by the grave finds of Pazyryk (lat. 50° 50′ N., long. 86° 10′ E.), in the eastern Altai, excavated in 1929. The finds are now in the Hermitage Museum in Leningrad.[1] They are attributed to about 100 B.C. The region is intermediate between the Siberian forests and the Mongolian and Central Asian steppe. It comes within the geographical range of the series of tribes anciently and in modern times centring on the Sayan, Altai, and Tangno mountains, and on the enclosed basin of the upper Yenisei, in the Tannu-Tuva Republic, formerly known as Urianghai or Tangno-Urianghai. In this grave were found several horses, which had been sacrificed to accompany the dead. Water, penetrating into the grave and freezing into ice which never thawed, had preserved them perfectly. Among the horse-trappings was a kind of combination mask and headdress in the form of reindeer horns; and not only this, but the saddles in the tomb were of the special type used with reindeer, differing from any of the horse saddles used by steppe nomads.

The careful and ceremonial imitation of reindeer suggests that the chief who owned the horses belonged to a reindeer-using people who had recently moved from the forests to the edge of the steppe; or who, without actual migration, had begun to change from the use of reindeer to the use of horses, but so recently that the important ceremonial for the death of a chief still demanded the sacrifice of reindeer. The decorated saddles, of a type better for use with reindeer than with horses, confirm the suggestion of recent migration or change. A ceremonial observance of this kind, testifying that old cultural associations persist after the culture itself has changed, is all the more interesting because it recalls the fact that certain of the Yakut people, living too far north in Siberia to use horses, have preserved, at least until recently, ceremonial horse skulls.[2] The Yakut are known to have been established at one time in the region of Lake Baikal,[3] and horses are still used by the southern Yakut. It is to be assumed therefore that as they moved northward, those who came into reindeer country gave up the use of horses, but still kept skulls of horses for certain ceremonial purposes.

In the territory between Lake Baikal and the Altai the geographical conditions permit an overlapping and interpenetration of the hunting economy (often combined with reindeer nomadism), the strict steppe economy and

[1] For references in English, see *Illustrated London News*, 6 August 1932; *American Journal of Archaeology*, vol. XXXVII, No. 1, 1933, pp. 30–45 and plates I–III; *Revue des Arts Asiatiques*, vol. X, No. IV, 1936, plates LXIX–LXXI. The Hermitage Museum is preparing a monograph to be published in the beginning of 1939. I owe this information, and the accompanying illustration, to the courtesy of Mr. Orbelli, of the Hermitage Museum.

[2] Statement in a lecture at Harvard by the late Professor Roland Dixon. I have been unable to verify the source.

[3] 'On the question of Turco–Mongol feudalism,' by N. N. Koz'min. Moscow–Irkutsk, 1934, p. 79.

even agriculture.[1] So far as I know, this is as true of the past as it is of the present. There is no reason whatever to suppose that in the past the different forms of economy alternated with each other, in response to climatic changes. On the contrary, there is every indication that they have always overlapped and interacted, and that an important reason for this was the fact that the geographical environment did not decisively favour one form of economy against the others over the region as a whole.

Neither the archaeological evidence of the Pazyryk finds nor observation of the Yakut in recent times necessarily indicates forced migration in response to climatic change. What both indicate is that on the periphery of a region favouring several ways of living, groups migrating away from the terrain suitable for reindeer have had to abandon their reindeer, and groups migrating away from terrain suitable for horses have had to abandon their horses; while in marginal terrain, permitting the use of either reindeer or horses, it can only be supposed that relative efficiency has influenced the historical trend. From ancient times to the present day however there has been no climatic change drastic enough to force the tribes that remained within the old environment to abandon permanently any of the occupations known to them. In what is now the Tannu-Tuva Republic the mixed hunting and reindeer economy, steppe pastoralism and agriculture are still practised within a short distance of each other.

Evidently, in considering geographical environment, transitional zones are of great importance, as well as homogeneous forest zones and steppe zones. They prevent abrupt cleavage between different societies and make possible a certain amount of cultural borrowing. The round Mongol felt tent, for instance, is usually considered peculiarly Mongol and peculiarly suited to the steppe environment. Yet its construction requires a great deal of wood, which has sometimes to be brought from a distance of 100 miles, or even more. Why do the Mongols not use a low, spreading tent, either of the Arab type or the type used by the nomads of the Tibetan plateau, requiring much less wood? The answer is that the Mongols do have such a tent, the *maikhan*, which is entirely different from the round felt tent or *ger*.[2] The *maikhan* is nowadays made of cotton material bought from Chinese traders, but in ancient times it may well have been made of woollen fabric. It is much more portable than the *ger*, and is accordingly used with caravans, while the *ger* is used by households camping at their regular pastures.

The *ger* in fact while admirably suited to the uses to which it is put in the steppe environment, shows evidence of being derived in part from peoples of the forest. The perpendicular wall of the *ger* is made of wooden trellis work, covered with felts. The domed or conical roof (the form varies a little regionally), is made of light poles, also covered with felts. Wall and roof are entirely separate units. The roof-poles are arranged much like those of an Indian *tipi*, or the spokes of an umbrella. The *ger* as a whole can therefore

[1] 'Studies in the history and economy of Tuva,' by R. Kabo. Moscow–Leningrad, 1934. See review by Owen Lattimore, in *Pacific Affairs*, vol. X, No. 4, December 1937.

[2] I use the common Mongol word *ger* rather than *yurt*, which is generally used by Western writers. The word *yurt* is confusing, because in historical literature it is also used as the equivalent of the Mongol *notok*—"home" in the territorial sense; also "feudal domain."

be described as a *tipi* which has been raised up on a circular wall. The roof or *tipi* part is the essential element. The wall is merely a later refinement, giving more head room. When Mongols are moving from one pasture to another, they frequently set up only the roof or *tipi* for the night's halt. When they camp for a few weeks or months, the whole *ger* is put up.

Now the Tuva forest tribes and the Reindeer Tungus use a true *tipi* or wigwam, covered either with skins or birch bark.[1] All things considered, I believe this to be the origin of the Mongol *ger*. At some time in the past, peoples living at the edge of the forest and the steppe moved out into the steppe for good.[2] They took their *tipi*-tents with them, and learned to cover them with felts. The flexible wall which now forms the lower unit of the *ger* may even have been originally a device for mounting the *tipi* on a cart, since it would be difficult to set either a *tipi* or any other kind of tent directly on a cart; though the improvement may also have been adopted simply because it gave more room. The *ger* thus replaced the ***maikhan***, which I believe to be the true steppe-tent, in general Mongol use. At one time the common practice of the Mongols was to move their tents on carts [3]; they then camped in large agglomerations of households, and the present habit of camping in small groups came later. The only survivals of the cart-tent that I have ever seen are those at the "sanctuary" of Chingghis Khan in the Ordos.[4] I believe that the change from large encampments to small, scattered camps, is to be explained by the fact that anciently the Mongol society was much more tribal than it is now. The tribal following of a chief was more important to him than the ownership of a strictly defined territory. The present division of the Mongols into "Banners," each with strict frontiers, and with public ownership of the Banner territory as a whole but regular assignment of pastures to clans or families, is of relatively modern origin.

From what has here been said it is plain that there have been intricate processes both of evolution and devolution in the history of such peoples as the Mongols. The established opinion, so learnedly and ably represented by Toynbee, that there is no "inner evolution" in the history of the steppe, needs to be modified. The processes are there, though the details are largely hidden from us—because, it must be remembered, the history of steppe-nomadic peoples has for the most part been written by settled peoples, whose accounts are biased by ignorance as well as by enmity.

It is also necessary to take into account the fact that evolution did not follow a straight line—for example, from a patriarchal clan society to a kind

[1] For descriptions and illustrations, see 'Unknown Mongolia,' by Douglas Carruthers. London, 2 vols., 1913. Also E. J. Lindgren, "North-Western Manchuria and the Reindeer Tungus," *Geogr. J.* 75 (1930) 518–36. See also Vladimirtsov's theory of the evolution of the *ger*, *op. cit.*, p. 41. There is another primitive form of Mongol dwelling, found in sand-dune regions where scrub willow grows freely, made of wicker covered with felt.

[2] It is not necessary of course to assume actual migration as the sole method of spreading the use of a particular kind of tent. Once the advantages and suitability of the tent had been proved, it could be adopted by people who had never themselves lived at the edge of the forest and the steppe.

[3] Vladimirtsov, *op. cit.*, pp. 37, 41, 86, etc.

[4] Owen Lattimore, "The shrine of a conqueror," *The Times*. London, 13 April 1936.

Good steppe converted into poor farmland, in the northern part of the former Tumet territory in the province of Suiyüan

Mixed grazing and farming land: southern pastures of Chahar Mongols now colonized by Chinese

The escarpment of the Inner Mongolian plateau: the pass from Kalgan to the Chahar pastures

Monastery introduced with Tibetan Buddhism: the addition of fixed property to nomad pastoralism

The palace of a prince. The tents in the courtyard represent the traditional nomad order

of feudalism, and from feudalism to imperial centralization. It followed what I can only describe as a spiral course: that is to say, it evolved upward toward a certain point, but at the same time it moved in repetitive cycles. This largely accounts for the fact that the history of steppe nomads appears to alternate between cycles of concentration and cycles of dispersion, without evolution. The recent Russian writers, who have made by far the most important contribution to the study of the economic factor, have to my mind somewhat stultified the potential value of their studies by underestimating the importance of the recurrent cycle and attempting to force their evidence into the pattern of a straight line of evolution.[1] Even when they recognize that peoples have at times fallen back from a relatively high to a relatively primitive level of culture, they fail to relate such devolution to the phenomenon of the recurrent cycle.[2] To assume for instance that the imperial centralization achieved by Chingghis Khan was something entirely new is to distort the earlier history of the succession of steppe peoples to which the Mongols belonged. The truth is that the dispersion and disorder of the Mongols and related peoples just before the time of Chingghis was a repetition of previous periods of the same kind; while the success of Chingghis in uniting the nomads created an empire greater than previous nomad empires, but not different from them in kind.

The repetitive cycle moreover was as important in settled countries like China and Persia as it was in the steppe. Strong dynastic centralization in the settled countries was followed by degeneration, the seizure and abuse of local power, and finally the fall of the dynasty, peasant rebellions, and a wild scramble for new power between rivals more or less indistinguishable from each other. In the steppe, centralization under a "khan of khans" alternated with the dispersal of tribes and the small beginnings of new concentrations. It was only by what I have called spiral repetition that a gradual advance was made toward the evolution of new forms. It is justifiable both to say that the T'ang dynasty in China (A.D. 618–906) repeated the history of the Han dynasty (B.C. 206–220 A.D.) and to say that it represented a higher point in the evolution of the dynastic form. In the same way the empire of Chingghis repeated the phenomena of the empire of the Hsiungnu, but also achieved certain advances in the form of the dynastic nomad empire and certain evolutionary changes in the society on which it was based. Without going into further detail, it may be added that the repetitive cycles in the steppe and in the settled countries cannot be studied apart from each other. It can be shown that the nomads were often, though by no means always, in the phase of centralization when the settled peoples were in the phase of decentralization. I am very much inclined to believe that the resultant invasions of settled countries by nomads, alternating with the intervention in tribal affairs of strong dynasties in settled countries, had a great deal to do with keeping up the repetitions of the cycle and preventing the more rapid and direct evolution of new forms in either the settled or the nomadic world.

[1] For instance Vladimirtsov (who however cannot be taken as a representative Communist author), *op. cit.*; also Кабо, *op. cit.*

[2] For instance Koz'min, *op. cit.* Also Ralph Fox, *op. cit.* (exceptionally well grounded in the modern Russian literature).

Yet throughout all this, it is true, evolution was in one sense decidedly limited; neither the steppe life as such nor Asiatic agriculture ever evolved into anything else. Neither of them created an industrial technique of the kind which has transformed the modern world. The geography of the steppe included or merged into forested regions and arable regions, but the dominant landscape was that of the true pastoral steppe in which, lacking the industrial technique, no society was possible except that of the nomadic herdsman. People were drawn away from the steppe life into marginal territories, into the civilized countries that were conquered at one time or another and into the patches of irrigated agriculture here and there in the steppe; but others were as constantly being recruited to pastoral nomadism from the forests and the marginal lands, and the steppe life therefore never ceased.

The main characteristics of steppe life show why this was so. It is based on an economy which is capable of being entirely self-sufficient. Its own resources provide the essentials of food, housing, clothing and transport, and even fuel (from cattle dung). Nor does it prevent the mining and working of metals on a small scale, as is known from archaeological evidence. The steppe nomad can withdraw into the steppe, if he needs to, and remain completely out of contact with other societies. He can; but so rarely does he do so that this pure condition of nomadic life can fairly be called hypothetical. For every historical level of which we have any knowledge there is evidence that exchange of some kind, through trade or tribute, has been important in steppe-nomadic life.

Since however contact with other societies was in the last resort optional, it seems that the most important agents in exercising the option were the nomad chiefs. It has been pointed out that the archaeological material so important for the earlier periods gives a wrong emphasis because the tombs of chieftains have been especially sought for, in the hope of finding gold ornaments and other spectacular objects, while the tombs of common people have on the whole been neglected, so that we do not have an equal knowledge of the subject population on which the power of the rulers was based.[1] There is in consequence a tendency, partly unconscious, to assume that the chiefs were representative of the culture of the people. It is nevertheless true that the graves of chiefs are absolutely indispensable for gauging the extent to which those chiefs enlarged the original power based on control of their own people and modified its character, acquiring new kinds of power and wealth by controlling the relations between their own tribes and other peoples.

This provides a valuable light in which to examine questions of historical geography. The theoretically pure steppe-nomadic life assumes a very close adaptation to geography. Otherwise the necessary symbiosis of the society and the herds providing it with food, clothing, housing, fuel, and transport would be impossible. The social structure of such a pure nomadic society must also have been very exactly balanced. Consequently either war and conquest or trade and accumulation would bring both changes in the supply and distribution of articles of daily use and objects of luxury, and changes

[1] 'Excavations in Northern Mongolia (1924–1925),' by Camilla Trever. Leningrad, 1932 (Memoirs of the Academy of History of Material Culture, No. III), pp. 22–23, and p. 22, note 1.

in the political gearing between chiefs and tribesmen. The chief would become actually a chief with new functions, though still basing his moral claim to authority on old sanctions. The society also, while remaining nominally the same (for the names of institutions change more slowly than their functions), would require new kinds of duties and services to be rendered by the tribesmen to their chiefs.

In such changes, the limiting effects of geographical environment must have had a great but variable importance. The environment which can support a theoretically pure nomadic society includes terrain which forbids anything but a pastoral economy, terrain which permits a combination of hunting and pastoralism or agriculture and pastoralism, and terrain which actually encourages development away from pastoralism toward hunting, agriculture, or even town-building and trade. Within steppe society as a whole therefore it can be assumed that some groups clung stubbornly to their steppe-nomad characteristics, in spite of wealth acquired by trade or power acquired by war, while others, in varying degrees, were prone to adapt themselves to external contacts or to accept new practices within their own territories. This is of course an extremely simplified statement. The number of possible variations is unlimited. The mode of life might remain almost unchanged in a given area, while the old population of the area—in some cases the whole population and in some cases just the chiefs and nobility—migrated to a new habitat in order to follow a different order of existence, leaving the old order to be carried on by newcomers.

I am sure however that there was one factor which time after time set a limit to the possibilities of social change: the extent of the area which favoured the life of the steppe herdsman was so much greater than any of the areas favouring a modification of economy, within or at the edge of the general steppe zone, that the steppe-nomadic society never permanently lost its ascendancy over other forms. The marginal areas permitted or favoured change and development away from the steppe-nomadic norm and thus kept up the ferment necessary to prevent history from stagnating. Their importance was immense. It is quite probable that the impulses governing the cycles of nomad dispersion and concentration, the fall and rise of dynasties and kingdoms, originated more often in these marginal areas than in the typical steppe because of the perpetual effort to change and adapt political power to economic changes and the resulting changes in the structure of society. This was indisputably true of the "time of troubles" preceding the rise of Chingghis Khan, who like his father and like Wang Khan of the Keraits, to whom for many years he acknowledged allegiance, held a border title.

These titles were granted by the Chin or Juchen dynasty, which had based an empire in North China on its mastery over the marginal terrain between the steppe and the sown in what is now Inner Mongolia and Manchuria. The Liao or Khitan who ruled before the Juchen-Chin were also a marginal people, lords of a marginal terrain. So were the Manchus, at the beginning of the seventeenth century.[1] The instability of these mixed societies had more to

[1] For the position of the Manchus in the tribal scale running from "extreme barbarian" to "semi-civilized" or partly Chinese, compare 'The Gold Tribe, "Fishskin Tatars" of the Lower Sungari,' by Owen Lattimore. Menasha, 1933. (Memoirs of the American Anthropological Association, No. 40.)

do with what we not too accurately call the "migrations of nomadic hordes" than is generally realized. Yet at the same time the special kind of power that could be asserted by control over the typical steppe nomads, in the typical steppe terrain, reasserted itself each time in a fresh convergence of tribes and peoples (of the most diverse origin) on the line that led toward a new ascendancy of the pure steppe-nomadic society, even though the hypothetically pure condition of steppe nomadism was probably never attained. Nor should it be assumed that the pure nomad is so primitive as to be a prisoner of his environment. Quite the contrary: steppe nomadism, though in one sense highly specialized, demands much more versatility, independence and initiative in the individual than, for instance, primitive agriculture. It is therefore an admirable preparation for rapid change and the learning of new activities, as was proved by the Mongols of the time of Chingghis Khan.

It is of special interest to consider the mechanism of cyclical alternations of this kind. Obviously climatic variation might add impetus and emphasis to either dispersal or concentration; but I do not think it can be set apart as a necessary factor, much less the sole agent, in any period of which we have any historical knowledge. A good test case is the question of the agriculture which is known to have been practised or patronized in the northern part of Outer Mongolia by the Turks of the sixth to the ninth century A.D. (contemporaries of the T'ang dynasty in China). This was not a primitive agriculture. Irrigation engineering was well developed. Why should agriculture have been introduced at all; why should it have been developed to a high level of technique; and why should it then have been wiped out entirely?

Almost ten years ago I suggested that the areas in Mongolia in which agriculture was possible and profitable were so dominated by the typical steppe areas that when a settled culture like that of the Orkhon Turks became prosperous enough to tempt plunderers, it was too vulnerable to defend.[1] This argument can be improved by taking other factors into consideration. The Turks of the Orkhon were nomads by origin, but they developed a good deal of trade both with China and with the oases of Turkistan. The sable and squirrel skins which they acquired from the forest peoples of the Baikal region and Urianghai (Tannu-Tuva) were important in this trade, because they were portable and represented high value for small bulk.[2] I do not know whether it is possible to state which came first, trade or agriculture; but it is fair to presume that each stimulated the other and that the chieftains of the Orkhon Turks were converted gradually into potentates of a certain luxury, whose revenues were far from being restricted to the levy of a tribute in cattle and services from exclusively pastoral subjects. Their own interests favoured the introduction of agriculture; and once it was established, they themselves became perforce rulers of a new kind.

The agriculture in question was intensive and irrigated. This may not have been due to uncertain rainfall so much as to the necessity for hastening the growth and ripening of crops in the comparatively short summer season. Whatever the cause, the result was something very like an oasis, but without

[1] Owen Lattimore, "Caravan routes of Inner Asia," *Geogr. J.* 72 (1928) 497–531.

[2] Koz'min, *op. cit.*, p. 18. The same author (*ibid.*, p. 17) cites the Orkhon inscriptions to emphasize the importance of agriculture.

Itinerant Chinese shearing the sheep and goats of the nomad Mongols for the Chinese traders

Chinese caravan traders, who have taken over the caravans passing through Mongolia

Mongol women roasting, in sand, millet purchased from Chinese traders

Western Chahar woman, married to a Western Tumet, preserving the traditional costume but living in a Chinese-style house

Mongol women roasting, in sand, millet purchased from Chinese traders

Western Chahar woman, married to a Western Tumet, preserving the traditional costume but living in a Chinese-style house

the geographical isolation of the Turkistan oases. A true oasis is an island in the desert; the cultivated areas of the Orkhon Turks created islands of intensified economy, supporting a society different from that of the steppe people, whose economy remained extensive, though modified by close contact with the settled areas. There was no geographical separation to keep these different interests distinct. Since both communities belonged to the same state, the rulers of the state had to straddle between their traditional nomad origins, which presupposed one kind of functions, and their acquired interest in the settled community, which created other functions. As the cultivable area was not large enough to allow for the transformation of the whole society, my own opinion is that there developed a tendency for the sub-chiefs of the steppe-nomad part of the nation to break away. Defence of their traditional privileges and importance could not stop short of war, eventually, against the encroaching interests of those supporters of the tribal sovereign whose power was based on the settled area. In any struggle of this kind the settled area, being relatively small, open, and populated in the main by unarmed peasants, would be hopelessly vulnerable.

Many writers have drawn attention to the obvious military advantages of the nomad, in Asia, over the farmer and townsman. The ordinary mobility of the nomad, arising out of his everyday life, could be converted into military mobility with no special expense. The townsman and the farmer could not withdraw to evade attack; the nomad could. The kind of plunder which nomads took from farm and town was, for them, immediate wealth which could be put to immediate use. The plunder value of a successful expedition against nomads was on the other hand no compensation at all for the expense, to a settled people, of equipping and maintaining the necessary troops.

These considerations are perfectly valid; but there is another which is far more important. The damage done to a settled people in prolonged war with nomads could easily result in the destruction of agriculture itself and the depopulation of wide stretches of country. A peasant population so impoverished as to be untaxable was of no use to its rulers. This was not true of the nomads. Plunder added to the power of the chiefs and made possible a greater concentration of tribal power. In every period of prolonged warfare between China and the steppe peoples, it can be shown that the ascendancy of the nomads gradually became more marked. Such periods began with scattered raids by various nomads, whose tribes are often difficult to identify, and culminated in serious invasion by a united steppe people that had acquired the status of a nation. When the Chinese held the ascendancy, on the other hand, they always won it rapidly, because they held it only at times when they could topple over a nomad dynasty or border state which had already become unstable, through conversion of the rulers and nobles from steppe chieftains with unmistakable functions into an aristocracy of conquerors with mixed and in part contradictory functions.

This lays bare a truth which is at the core of all steppe-nomadic history: it is the poor nomad who is the pure nomad. When they have modified their economy, their society and above all the status of their chiefs, nomads become vulnerable. The chiefs and nobles become less effective in their original functions, because they become attached to new vested interests in trade,

the levy of new kinds of tribute and the taxation of new, non-nomad, agricultural and urban subjects. In times of defeat, on the contrary, as the chiefs are stripped of these hampering privileges and as the nomad society as a whole is forced back closer and closer to the level of the bare necessities and prime characteristics of a nomadic life, it gets nearer to the sources of its true strength. Poverty sharpens the hunger for war of the whole people, and new chiefs begin to rise who, with no extraneous vested interests as yet and no non-nomad sources of privileged income to safeguard, are willing to head new ventures.

Consequently it is possible to understand why agriculture and even considerable towns have intermittently appeared, flourished, and been blotted out, not only in Northern Mongolia but even more frequently in the border country of Inner Mongolia (including the western part of what is now Manchuria). They marked recurrent modifications of parts of the nomad society toward a way of life resembling that of oasis peoples in everything but geographical isolation. They arose as products of the glory and increasingly sophisticated luxury of rulers who were of nomad derivation. In time this encrustation prevented such rulers from exercising efficiently those functions in the nomad society which were still essential to the maintenance of their power. When they fell, most of what had been added to the nomad society disappeared with them; but the poorest parts of the steppe remained a permanent reservoir in which the essentials of the nomadic way of life were preserved.

This whole era of history has now closed. Industrial civilization, with its mines and factories and new means of transport, can span the desert and coordinate the farm, the town, and the steppe as no ancient civilization could. We shall not see again the old cycle of tribal war, the conquest of settled countries, the decay of dynasties unable to stand for long with one foot in the steppe and one in the settled country, and tribal war again.

Yet certain lessons of the old history remain of value. In Outer Mongolia, when an attempt was made to press the economic and social revolution too hastily, people slaughtered their cattle and, seemingly, destroyed the main wealth of the community.[1] The poorest people could withdraw into the poorest country and there survive by the herding of an almost unbelievably small number of livestock. These people, able to live in the ancient Mongol way, closely approximating to the pure nomadism which I have called hypothetical, were obviously the root of the Mongol nation. Ways have now been found to attract them to the support of the Mongol Revolution,[2] instead of driving them back into reliance on the ancient resources of steppe nomadism, but the truth remains: the poor nomad is the pure nomad, best able to survive under the strictest conditions of the old life, and at the same time best able to evolve into new ways of life.

[1] From the Report of Gendun, Prime Minister of the Mongol People's Republic, to the Seventh General Assembly, in *Pacific Ocean*, 1 (3), January–March, Moscow, 1935.

[2] "Historical lessons of fifteen years of revolution," in *Pacific Ocean*, 3 (9), July–September 1936. (Report by Doksom, President of the Little Assembly, to the Jubilee 21st session of the Little Assembly, together with a brief résumé of the report of Amor.)

DISCUSSION

[*This discussion followed a lecture entitled "Mongol landscape and Mongol people," which was a first draft of the paper since elaborated and printed above.*]

Before the paper the PRESIDENT (Professor HENRY BALFOUR) said: We have in recent times had various communications relating to the Far East. To-night we are moving a little farther north and entering Mongolia proper. Mr. Lattimore has travelled very widely indeed not only in Mongolia but also in Manchuria, Turkistan, and China, and has covered an immense amount of country. I am sure we look forward with very great interest to what he has to tell us about that extremely interesting high-level region of Mongolia, and I ask him now to give his lecture.

Mr. Lattimore then read the paper, and a discussion followed.

The PRESIDENT: I am glad to see Sir Francis Younghusband is here. He is one of the pioneers of travel in that region, and so I ask him to come and address us.

Sir FRANCIS YOUNGHUSBAND: It was in the year 1887 that I was in the part of the world which you have heard described so clearly and graphically this evening. I can assure you that if you were ever in it you would not be able to help feeling like those Mongols whom Mr. Lattimore has described; you would want to go wandering away into the unknown. I wandered all the way to India, but all the time I was wondering what it was that caused the Mongols under Chingghis Khan to make those tremendous waves of conquest right across Asia. When I was there the Chinese were beginning to encroach upon the best parts of Mongolia, gradually getting hold of the Mongols and eating into their lands. That process has been going on still further.

What interested me was what Mr. Lattimore said about it being, as I understood him, an economic encroachment by the Chinese which drove the Mongols westward over Asia and finally into Europe. I think the theory in my time was that the desiccation of their pasture lands made them move westward. What was the impulse that sent the Mongols clean away across Asia from one end to the other? Perhaps the economic pressure may have started them off, but there must have been in the Mongols themselves some tremendous spirit of adventure that would lead them on year after year to spread themselves over Central Asia and down into India and, finally, to found the Mongol Empire.

As to the Mongols of the present day, we did see Mongol horsemen in Tibet, when we were besieged in Gyantse. One of the great terrors held up against us was that the Mongol horsemen were coming. The Mongol horsemen did come, but they did not frighten us much.

An interesting point is the way in which these rough, wild, and in some ways uncouth, peoples attach importance to religion. You have heard the ceremonies described. You have seen pictures of what took place, and you have seen the tremendous reverence that the people pay to lamas and to their holy men. Mr. Lattimore has described the ceremony in which the people offered up thanksgiving for the results of the year. I think that is a universal instinct amongst all peoples who are as closely in touch with Nature as these Mongols are. Dependent, as they are, upon their pastures, there is created in them a sense of gratitude to some Unseen Power which they feel around them, and which provides them with the food upon which they themselves and their flocks and herds, ponies and camels, are fed.

I am sure we are all extremely grateful for this most interesting and informative lecture which Mr. Lattimore has given us, and he must greatly value this oppor-

tunity of investigating the Inner Mongol life before it has had time to pass entirely away.

The PRESIDENT: We also have with us Mr. Butler, who was Consul-General in Mukden, and we should be pleased if he would address the meeting.

Mr. P. D. BUTLER: Although I have spent two years in Manchuria where there was a large Mongol population, I have not been in Mongolia proper and know very little about it. I have of course studied the Mongolian problem from its political aspect. Perhaps the relation of the Manchurian administration to the Mongolian population may be of some interest to the meeting.

The Mongol provinces of Manchuria are known as Hsingan and are an autonomous part of Manchukuo, administered by the Department of Mongolian Affairs in the Manchurian Cabinet. The Minister is a Mongol and the Vice-Minister a Japanese. The present Vice-Minister is Major-General Yoda, of the Japanese Army, whom I have had the privilege of meeting in Hsinking. He is most sympathetic to the Mongols and a very able administrator. It is fortunate that the Mongol population of Manchukuo have a man like General Yoda to protect their interests. One of the difficulties which the Japanese have to face in dealing with the Mongol population of Manchukuo is the lack of Japanese with ability to speak the language and understand the inhabitants. There are probably only about ten or a dozen Japanese, usually military men, who speak the Mongol language fluently.

The Japanese in their Mongol policy in Manchukuo are trying to influence and control the Mongols through their religion, and in the course of the last year or two several lamas either from the Hsingan provinces or from Inner Mongolia have been sent to Japan to study in temples and, conversely, I think about ten Japanese Buddhist priests have been sent to lamaseries in Mongolia. The Japanese themselves appear to feel more in sympathy with the Mongols than with the Chinese.

As for the Mongols themselves, the Japanese, since they have come into Manchukuo, have rendered them at least one great service, in that they have up to the present checked Chinese penetration into Mongol territory. It remains to be seen whether they will be successful in doing so indefinitely. But the Japanese have one, perhaps natural, defect in handling a very independent people like the Mongols, and that is that they have too great a tendency to paternal government. There is a little too much red tape about it. As I understand the Mongol, he is a man who does not readily take to interference with his own customs.

Dr. BARBOUR: It may seem almost impertinent to make any reference to the way in which the speaker has shared his experiences with us. So many travellers return from afar and describe the things that they have seen objectively, talking of other peoples as "they." When Mr. Lattimore speaks one realizes that he has so far identified himself with those among whom he has travelled that he feels and thinks as one of them. This intimate understanding of the Mongols seemed to break out in all kinds of ways in his lecture—even in the humour of what he had to say—suggesting that he was already conscious of the actual feelings and reactions of the people he met almost before they spoke.

I too have looked with longing at those sand dunes across the river Hwangho, at Paatou, but never crossed. Those drifting sands, and the remark made by Mr. Lattimore about traffic on the trade routes, give point to the question put by Sir Francis Younghusband on a matter upon which I too seek more light: namely how the physical conditions of the country have changed in recent times. The speaker remarked that one no longer sees the carts that were unquestionably used on those routes in mediaeval days. How far is this

change in mode of travel the result of altered climatic conditions? On his return from the Third Central Asiatic Expedition, Dr. Ralph Chaney made an interesting comment on one of his photographs. It showed a valley-terrace on which the trees were of three distinct heights—large, medium, and small; there were no intermediate sizes. Dr. Chaney interpreted this to mean that only at intervals of some thirty or forty years were there periods with sufficient seasonal moisture for new seedlings to take firm root. Does Mr. Lattimore feel that a slight, more permanent change of climate has fundamentally affected the ways of travel and life of the people? Or does he attribute the observed changes (at least in the marginal districts where he saw evidence of former cultivation now abandoned) to the other course he suggested—so that we have a Mongolian parallel with what has taken place in the Nebraskan and Kansan parts of the dust-bowl, where man himself has been a trouble maker by disturbing the soil?

May I in conclusion thank you, Mr. Lattimore, on behalf of myself and others who have listened with delight to a most instructive description of the Mongolian people and their ways.

The PRESIDENT: I will ask Mr. Lattimore to reply.

Mr. LATTIMORE: With regard to Sir Francis Younghusband's reference to Mongol migrations and conquests and Mr. Barbour's mention of desiccation, my own theory takes into account the importance of border states and tribes in originating the "wave motion" of nomadic wars. There is the evidence of former settled areas in Inner Mongolia, to be found most frequently in relatively hilly, well-watered land, which must once have been cultivated. There has undoubtedly been a fluctuation of settlement and nomadic life over wide areas in Inner Mongolia; but only when these areas have been plotted out on a fairly extensive map shall we have more to go on in determining the relative importance of human and climatic agencies in periods of desiccation and moisture.

With reference to Mr. Butler's comments on the political situation of the Mongols in Manchuria, I would endorse very strongly Mr. Butler's opinion of the unwilling response of the Mongols to anything like over-paternal government. Anybody who has had much to do with Mongols knows that you can lead, though you cannot drive, a Mongol.

Sir Francis Younghusband has described the Mongol horsemen who confronted the British forces at Gyantse. I would like to describe a "military or semi-military manifestation" which had spread all the way from India to Inner Mongolia. At a ceremony presided over by the Panch'an Lama I made the acquaintance of three buglers and a drummer of the Panch'an Lama's band who described themselves as born of Tibetan fathers and Darjeeling hill-women. They said that Russian music was lovely, though there was nothing to equal Mongol music for its combination of melancholy spirit, gentleness and fire; but there was one song, they said, that could beat anything in Mongolia. It was *the* song of all the world, the finest ever sung, the Song of Darjeeling. On being requested to sing it, they very solemnly rendered "It's a long way to Tipperary."

The PRESIDENT: It is seldom that we have had the opportunity of listening to such an eloquent and vivid description of a people. I must say that I have most thoroughly enjoyed the lecture, and I am certain that you have also. Mr. Lattimore has not only described to us the people and their mode of life, but he has brought out for us the way in which that life has been created by the environment, the way in which a people has reacted to its environment, and the effect of the environment upon the people. Such study is, to my mind, one of the very important objectives of geography. Perhaps I am rather

anxious to take this view, because I am always looking for opportunities of finding some sort of justification for having an ethnologist presiding over this Society. I thank Mr. Lattimore very much for having dwelt upon that dual aspect of the life of the people and the environment in which they live. It brings ethnology and geography together in no uncertain manner.

One cannot but wonder what is going to be the ultimate fate of these people. Traditionally they have been brought up and have developed as pastoral nomads of herding habit, constantly roaming about, and developing their own form of transport by means of the horse and camel. As a matter of fact, as far as horses go they are almost one with them, like the centaurs of mythology. What are they going to do in face of further and further encroachments of agriculture with its sedentary tendency upon an area of semi-nomadic traditions? What are the horsemen and camel-men going to do as the motor car enters upon the scene, as indeed it has already begun to do?

These problems are of the very greatest interest. We can only speculate about them. Their solution is not yet, I think, though there are signs of adaptability. There can be no question but that the Mongols themselves are peoples with great potentialities. They showed it in the old days when there were great leaders who could knit them together into a compact whole; and what they did in the days of Chingghis Khan and his successors Kublai Khan and Tamerlane was very marvellous. They covered an area astounding in extent; they came very near to linking the Yellow Sea with the Atlantic. They did not quite do so, but at any rate they did perform most marvellous journeys under those conditions of organization. That shows what great possibilities there are in such people, and one can only express the hope that those possibilities will be realized and developed, so that they can be made the best use of.

I know you have all thoroughly enjoyed this exceedingly attractive lecture from Mr. Lattimore. Personally I thank him most heartily, and I am sure you wish to join me in so doing.

THE CYCLOPS MOUNTAINS OF DUTCH NEW GUINEA

L. E. CHEESMAN

THE Papuan insect fauna, which is very distinct and very rich in forms, extends outside the island of New Guinea to adjacent islands and to tropical Queensland. By some means it has spread in a south-easterly direction as well, through the Solomon Islands and the New Hebrides as far as the Society Islands in the mid-Pacific. For the last ten years my work has been to follow this Papuan element in the Pacific islands back to the land of its origin; making collections on islands from which we had no material in the national collection, in order to study the distribution of species in that region. In 1936 I spent a year in Dutch New Guinea on an expedition to the Cyclops Mountains to collect for the British Museum. I was allotted a grant in aid of expenses from that Museum, and also from the Percy Sladen Trust. I should like to take this opportunity of thanking the Trustees of both.

My collection of insects made in the Territory of Papua in 1933–34 suggested to me that there must have been formerly older land connected with New Guinea, which possibly had not been entirely submerged during the late Cretaceous. For palaeontologists postulate a land mass there which extended somewhere between New Zealand and the Asiatic continent. It is supposed that during the middle Cretaceous New Guinea became separated from Malaysia and later from New Caledonia, and that during the late Cretaceous it was submerged to re-emerge during the Tertiary. The population from some older land must have spread on to New Guinea, for the greater part of the island is young, being aligned with the Himalayan geanticline. The very rich Papuan fauna and flora cannot have evolved on land raised from the sea during the Miocene–Pliocene; they are basically mainly of Asiatic origin.

There is considerable biological evidence to support the supposition of the separation of New Guinea from Malaysia. Certain of the Papuan floristic and zoological groups—frogs and scorpions as well as insects—extend to China through the Moluccas and the Philippines but are not represented on the islands to the west. Those which on the other hand are also found in Malaysia are as a general rule widely distributed and rather rare forms which suggests that they belong to an older fauna. It is satisfactory when biological and geological evidence are not conflicting.

If any land in New Guinea has remained dry since an early period it would probably be found north of the main central chain, where there are relics of very old mountains.[1] Thus my recent expedition had a two-fold object, to make a systematic collection in one of New Guinea's oldest mountain ranges, and to gather any information concerning the topography of the district which might throw light on problems connected with the origin of its insect fauna. In this respect it was illuminating to learn that the Cyclops

[1] In the few papers published on the geology of New Guinea (F. R. C. Reed, 1921; E. R. Stanley, 1923; Sir Edgworth David, 1932, etc.) no reference is made as to whether these mountains have recently emerged—the all important point to zoologists.

Range and Mount Bougainville near the Dutch–British boundary, and the Torricelli Range farther east in the Mandated Territory are of pre-Cambrian continental rock showing no sign of submergence; and that these three masses were formerly islands.

Information regarding the geology of that part of New Guinea could not be obtained in England, but while passing through Netherland Indies I was shown geological maps in the Dutch Government Library at Ambon.[1] From these it is evident that no marine deposits have been recorded from the Cyclops Mountains or Mount Bougainville, but that there is Miocene–Pliocene limestone inland on their southern side, which suggests there having been sea there. In the limestone area between Hollandia and Lake Sentani I found a very striking fragment of an old coral cliff about 140 feet high. Rock specimens from this cliff contained *Foraminifera* which have been determined as post-Eocene, as are also some which I obtained from the low, limestone hills south of Lake Sentani. A fossil shell (*Strombus* sp.) from a stream bed in the same area proves to be Tertiary.

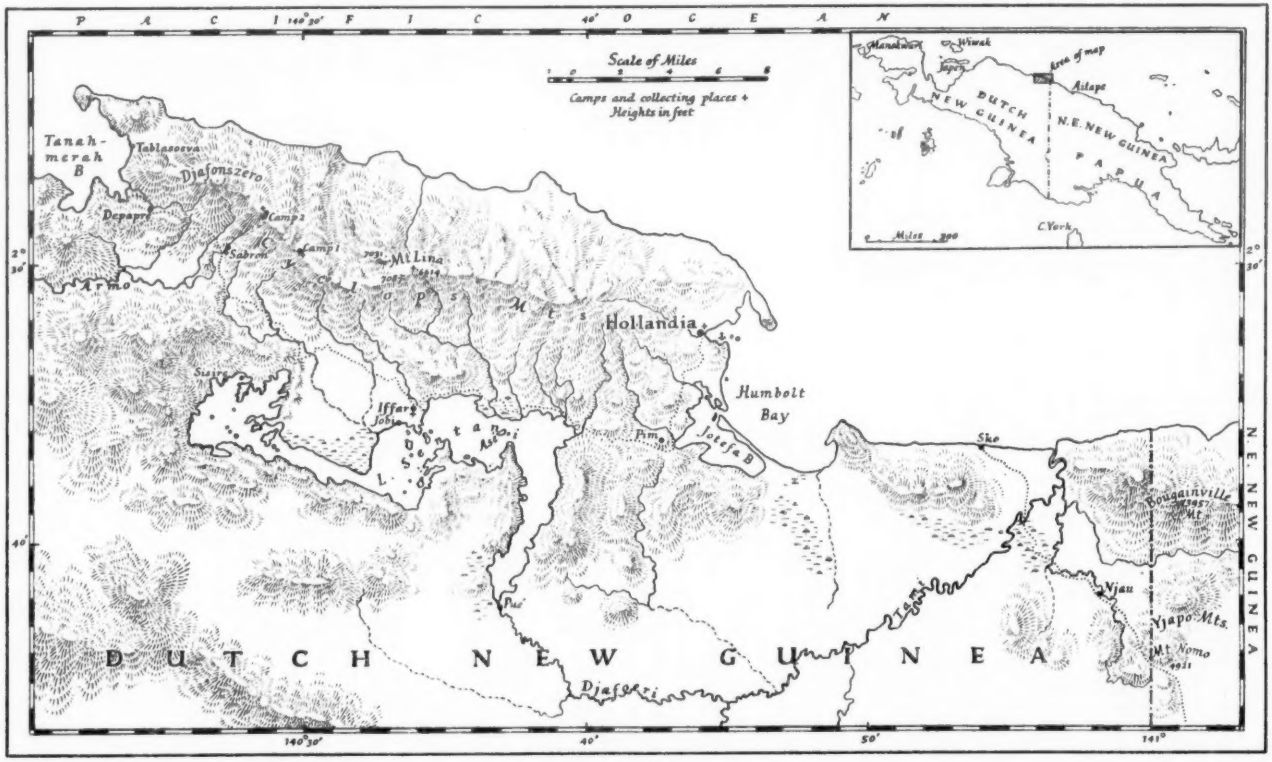
It appears therefore that the Cyclops Range has been an island, and that its crystalline schists and gneisses have remained above the sea since very early times. While on my way back to Sydney at the end of the year I met members of the Oil Search Company who have been working in the Torricelli Range for eight years and have thoroughly surveyed that district; from them I learnt that they had come to the same conclusion regarding that range: that it was formerly an island and shows no sign of submergence.

All these old mountains are of a similar formation, and belong to the same geological period. What is worthy of note is that they have the same trend as the crystalline schist mountains on the island of Jappen (Jobi) and of old ranges on Vogelkopf. But these have never been investigated to ascertain how long they have remained above water. From a biological standpoint they may not be so interesting.

The Cyclops Mountains are a coastal range 30 miles long at the north-east corner of the Dutch Territory situated between 141°–142° E. with a slight trend from W.N.W.–E.S.E. They are not very lofty, the highest peaks being between 6000 and 7000 feet. West of the range is a large bay, Tanah Merah Bay, with a depth of 35–40 fathoms in the middle, but open to the dangerous north-west winds which blow hard for half the year. East of the range is Humboldt Bay, which is still larger and extends to form an inner bay, Jotefa Bay, the eastern side of which is sheltered for ships. On the north-east point rises Mount Bougainville (or the Oinake Massif) which is 4000 feet high. Between the two bays the northern coast of the mountains is extremely steep and rugged, suggesting subsidence on a large scale. There is no inlet or safe anchorage, but only drowned valleys, high cliffs, and bluffs cut off suddenly by the sea.

East and west of the range the land is low, so that the mountains could not fail to attract the attention of any of the early navigators who came within sight of that part of the New Guinea coast. Tasman in 1643 was the first to sight the butt end of the range from Tanah Merah Bay, and he saw the highest

[1] Geologische Overzichtskaart van den Nederlandsch Oost-Indischen Archipel. 1927. Map XIV, Atlas Verh. 1. Jaarboek van het Mijnwezen in Ned. Oost-Indie.



The Cyclops Mountains

peak of the western mountain complex, Mount Djafonszero. Baron Louis de Bougainville in 1768, after passing round New Ireland, sailed along this piece of coast from the east, and recorded "high, mountainous land with a W.N.W. trend and a large bay." He named two conspicuous peaks "les deux Cyclopes," but as he kept 10 or 11 leagues out from the coast he could not describe it in detail. Dumont d'Urville was the first to anchor in the bay in 1827, which he named after Humboldt because he considered—as he says—that of all the scientists Humboldt was the only one likely to have appreciated the achievements of his voyage in the *Astrolabe*.

The old name for Humboldt Bay is Telok Lentjoe, which appears on some old maps. D'Urville named Mount Bougainville after Baron de Bougainville, and Cape Bonpland and Cape Caillié after members of Humboldt's expeditions. The native name for Cape Bonpland (which marks the Dutch boundary) was Seko, and this still survives as the name of a village on the coast. D'Urville also defined the limits of the Cyclops Range before he sailed away. In Humboldt Bay is an historic spot where other famous ships besides the *Astrolabe* have anchored, including the *Etna* in 1858, and the *Challenger* in 1875. Various expeditions have been sent there by Dutch Government Commissions, including a scientific expedition in 1903, whose staff did not however include an entomologist.

Long before the arrival of the Dutch this strip of coast, from Tanah Merah Bay to Mount Bougainville, was known to Chinese and Malay traders. Early in the fifteenth century there was already a brisk trade in bird-plumage, damar, pearl and shell, and turtleshell. The early plumage trade is of special interest because it was carried out peacefully and satisfactorily with Papuan tribes which to-day are suspicious of white men or even hostile. For years Chinese and Malay schooners visited the coast periodically and Malay hunters penetrated right into the interior of New Guinea. They kept to certain defined trade routes, which, though they were no more than bush tracks, were recognized by Papuans as lawful thoroughfares for Malay bird-hunters and for the natives employed by them. They travelled very long distances, and there must be few parts of the island where they have not been heard of. It is quite usual for white officials going inland to what they imagine to be unexplored territory to find that the natives have been familiar with Malay traders for a long period. What is peculiarly interesting is that some of the old trade routes which are no longer in use can still be traced by Malay words which are in current usage far inland among Papuan bush tribes who have never travelled to the coast.

It was the European plumage trade and white hunters who made the bush natives hostile. Humboldt Bay was renowned as one of the chief centres in New Guinea for trade in bird of paradise plumes, and when during the Great War the British prohibited the trade in the German Territory, "bird runners" for many years after continued to export plumage from Humboldt Bay. Now that this is strictly prohibited there is little trade of any kind in Hollandia, and no truculent natives. The Wari tribe, who were responsible for many murders of white and native hunters, have withdrawn to the extensive sago swamps south of Lake Sentani.

Hollandia, the port of call for the monthly steamer from Makassa, is a

very small village, the inhabitants being Malay and Chinese, with a government representative at their head, the *Controller*, who is under the Assistant Resident at Manokwari. The Resident of the Moluccas and New Guinea resides at Ambon. A good road has been made by the Dutch which starts from Humboldt Bay, skirts the mountains on the south, and ends at Tanah Merah Bay. This is regularly patrolled. Natives of the villages near this road and of the coastal areas are taxed, but the Dutch have not so far attempted to control the inland tribes.

There are very few planters in the whole district and the majority of these are half-castes; only seven are white men, three of these being Germans who came over the border after the Great War. All the native population live in houses built on piles around the lake, and on the coral-protected shores of the bays. There are very few villages inland and none on the Cyclops Range, which I conclude is due to the fact that these Papuans are nearly all *orang laut* (people of the sea) and have the same innate dread of forest and mountains which the *orang hutan* (people of the forest) have of the sea. The language used is a degenerate Malay, the esperanto of the Dutch Territory, with which these Papuans are familiar owing to their long connection with Malay traders.

Before encamping on the Cyclops Mountains I made one trip inland outside the range, through the swamp country behind Mount Bougainville as far as Mount Nomo, south of the Yjapo Mountains on the boundary. I accompanied Herr Stuber, a German planter in the Dutch Government service who was making a reconnaissance with a view to opening up a road leading to gold-bearing country farther inland. As he is a collector of orchids and butterflies Herr Stuber is friendly with the Papuans of that district.

It is interesting country, though not very agreeable for travelling. For two days we were walking through sago swamps with occasional belts of forest on a bush road used by members of the Boundary Commission in 1910. The river Tami and its tributaries drain this low plain, the Tami being a muddy, crocodile-infested river which we had to cross by prau. It carries the overflow of Lake Sentani which lies at the foot of the mountains and is supplied by mountain torrents. The previous week had been rather dry and the water had shrunk more than 7 feet. This exposed very deep mud in the bed on either side of the central channel, and the carriers had considerable difficulty in getting the prau near enough to the banks. We had to wade ashore up to the waist in mud.

In one open glade we were fortunate in seeing eight Goura pigeons feeding on the ground on fallen fruit, enormous birds as large as half-grown turkeys. It was a curious sight to see how awkward they were in getting on the wing, and the noise of the flapping was amazing. They were of a blue-grey colour, lighter than any I have seen and may belong to a new species.

On the third day we reached Njau (a new village several miles south of the old one marked on maps), and made a camp between two mountains—one of them Mount Nomo—half a day's journey beyond the village and collected in that neighbourhood as long as provisions lasted. Since my return I have heard from Herr Stuber that he opened up a new road over 90 miles long,

passing into the territory of the Wari tribe armed only with a butterfly net, and meeting with no opposition.

My first camp on the range was in the central complex. Wishing to collect in mossy forest I had two huts built on a native trail which crosses the range from Lake Sentani to the northern coast; the trail was made originally in order to fetch salt and is still used by Sentani people for that purpose. My camp was made on a triangular piece of level ground, near a stream at the base of one of the Cyclops (called Mount Lina by natives of the island of Asé on Lake Sentani). Mount Lina is a conspicuous, thimble-shaped cone nearly always wrapped in cloud: its sides rose sharply behind the camp to about 6500 feet, of rock with a thin superstratum of black soil, and densely forested with huge trees. The first necessity was to have a clearing cut about 1000 feet higher than the camp for collecting purposes; and also for the moth-screen where it might command the lower forest. There was little choice of suitable sites since all sides of the mountain are equally steep. One advantage in opening up the forest on these precipices is that the work of clearing is comparatively easy; for the boys fell the trees on the upper part so that they bring down other groups, which all thunder down together into the valley below. But it required considerable ingenuity to build up a safe platform of roots and soil in front of the screen wide enough to stand upon, and with a palisade in front to prevent our pitching over the edge in the excitement of catching insects. To reach the screen I had a good trail cut from the camp; and it was necessary to have a hand-rail of *rotan* roped from tree to tree because in places it was like walking up a wall.

Half the day could be reckoned upon for ordinary collecting when the mountain was partly free of cloud; on some days there was no sunshine at all and there were many days of continual rain. Nevertheless the collection grew apace, and fully justified any effort or trouble, and the interest of it outweighed discomforts. The vegetation of the higher zone was rather sharply delimited by my clearing. Above it the immense trees grew more sparsely with a dense undergrowth of climbing ferns, small palms, and low shrubs; a rhododendron with a shell-pink blossom took advantage of any small glade made by fallen trees; heather, orchids, ferns, and mosses were in abundance everywhere. Ferns common near the camp were replaced by montane forms; and the stinging plant (? *Laportea*), which monopolizes all the lower slopes, ceases suddenly at about 4000 feet. Though the trail was kept clear it was impossible to eradicate this plant, and when we groped our way back to camp at night we were always stung. The boys dreaded it as much as I did, for it inflicts a severe sting which throbs for twenty-four hours afterwards and irritates for days. Another pest was the leeches, which swarmed all over the wet ground. Mosquitoes bit by day and night; and a minute, biting midge attacked in clouds on thundery nights so viciously that I have seen the boys crying with the pain and irritation.

Low banks of streams make good collecting grounds, but most of the mountain torrents had carved very deep gullies whose sides rose sheer to the sky. Huge grey boulders of schist-assemblages block the beds, studded with minute garnets or sparkling with crystals; and ground fine by the swift rush of water are sands of mica-schist, albite-schists, and quartz. From my

Cyclops Mountains and Mount Lina seen from Sabron

View of the mountains from Camp Rajahwali

Southern shores of Lake Sentani, with Tertiary limestone hills

Village of Sisiré on Lake Sentani

clearing quartz cliffs of a dazzling white showed through forest on the mountains on either side of Mount Lina, and jagged masses of quartz protruded from the soil everywhere.

I spent the month of April on Mount Lina, which is a transitional period between the two seasons, at the end of the rainy season and before the season of the south-east winds sets in. This from my experience is the best time for mountain collecting because between the rainstorms the summit may be quite clear, whereas, when the lower levels are enjoying the so-called dry season, the mountain tops are always hidden in clouds. The average annual rainfall of Hollandia is 110 inches. In the mountains it is of course far heavier. About ten days before I broke camp there was a thunderstorm which lasted fifteen hours, and thereafter the site remained under water. The ground could not be thoroughly cleared as there were several gigantic trunks on it through which the boys hacked openings; or if the wood were too hard they made steps in the bark. The smell of rotting vegetation and wood in that moist, hot atmosphere was distinctly trying, but it was fortunate that even so unsatisfactory a camping ground existed right on the range.

Every week or two my four camp boys were sent down to Iffar with all the scientific material which was sufficiently dry to be packed; and this was kindly stored in a dry room by the *Bestuur* of Iffar until I could mail it to London. By this means the specimens did not remain long enough in that excessively moist atmosphere to be affected, and reached the British Museum in good condition. The natives are much addicted to stealing, and in camp it is very difficult to keep one's possessions under lock and key. I therefore purposely hired boys from two rival villages; one boy of each village was sent down to Iffar, and the remaining two watched each other jealously and would not combine in any thieving.

The positions of the next mountain camps were chosen because they offered rather different conditions in the centre of the widest part of the range, not actually in mossy forest but at its lower margin. They were rather drier and decidedly more pleasant. I moved my equipment to the rest-house at Sabron, where I hired boys to make clearings and build huts in two different localities. Later I hired a room in the house of a Dutch ex-policeman, and made this my headquarters, having my collecting equipment and stores transported to the two camps as required.

Sabron consists of a Papuan village and also what is called "the colony." This is a settlement of half-castes and "Indians" from the East Indies who failed to make a livelihood there. Owing to a modern Dutch movement to educate the Javanese many of these now qualify as clerks and teachers: posts which were formerly filled by the half-caste section of the community, some of whom consequently fail to find employment. The Sabron Colony was inaugurated and is supported by a charitable organization whose governing committee is at Manokwari. The experiment has not proved successful, and the Dutch Government, which never encouraged the scheme, is now taking measures to prevent the introduction of more colonists. Boys of the native village of Sabron were very unsatisfactory, but I had to make the best of them. They were extremely lazy, dirty and unreliable; all their work needed personal supervision, and one had to exercise unlimited patience in dealing with them.

Camp 1, which I named Barum taun (Hornbill), was at about 2000 feet, with a good slope facing the central peaks. Camp 2, or Rajahwali (Eagle), at 2500–3000 feet was an ideal collecting centre, from which I had access to the mountains immediately below Djafonszero, and to a large valley south-east of that mountain. Each camp had a good supply of firewood, and a tin of provisions chained to one of the piles of my hut. I could therefore encamp at whichever site offered the most favourable opportunities at the moment, without having to send for extra carriers or make much extra preparation.

From Rajahwali a glorious panorama of forest and mountain was opened to view by my clearing. The spread of the enormous trees is best realized where they can be seen from above, and often masses of scarlet, pink or cream indicate that some are in bloom, a fact which would not be realized from below until the flowers drop, when one is reminded of the great size of the tree by the extent of the area covered by fallen blossoms. The camp faced north-east, the horizon formed by the high, thin ridge of Djafonszero, whose sides are either vertical walls or else extended in spurs, so thin that the trees on the skyline appear as a serried line with wide gaps of blue sky between them. Topping them all are magnificent specimens of New Guinea pines (*Araucaria*), and one of the Nipa palms. Between Mount Djafonszero and the next mountain to the east is a larger valley in which a very swift river (whose name I could not discover) has made a channel in what was once a wide bed; the course of the present river could be seen from the camp on clear mornings, traced as a furrow through the forest. The river Armo rises south-east of Mount Djafonszero and flows in a more leisurely fashion to Sabron.

I remained at Sabron over three months building up the collection steadily. But in the last fortnight the natives started an amazing report that the Dutch Government had ordered two Papuans to be decapitated, in order that their heads might be laid with the foundations of a new radio station being built at Hollandia. A fictitious headhunter, who was supposed to have been selected for this deed, was then seen by Papuans in many different places at once, one of these being my camp. Boys who were employed at Sabron and elsewhere ran back to their own villages, or even hid in the forest armed with spears. Those who still dared to work carried spears with them, and left them in a convenient place close at hand. I could not obtain any boys, and was obliged to spend a fortnight entirely alone in the mountains. I had even to carry up my own stores and paraffin for the lamps, by making dumps at intervals.

Iffar, on the borders of Lake Sentani, which is a small government station, made a convenient centre for work in the neighbourhood of the lake; here I was kindly allowed to occupy a room and part of the veranda of the rest-house. Sentani has a large native population living in many villages on its shores and on the two islands. Some of the houses are enormous and hold one thousand people. They are a hardy, independent type, engrossed in their own affairs and industrious. In some villages they are of very mixed blood, and one recognizes Malay, Netherland Indian, and Chinese traits. Natives from the villages on the farther sides of the lake, south and west, are less sophisticated, and make more satisfactory servants. They have to be trained to camp ways.

The lake is 16 miles long but only 4 miles across in the widest part. Its undulating form suggests two lakes or more which have become united. According to the Dutch the bed has been raised 200 feet and the greatest depth is about 75 feet. Low, rounded limestone hills form its southern boundary; but on the north, spurs of the Cyclops Mountains come down to the shore. Sago grows in all the low-lying land; this and the fish support the native population. There are extensive areas of alluvial soil to the west and south.

Members of the *Etna* expedition were the first to sight the lake when they climbed the grassy hills near Pim, but they took it for a deep inlet of Humboldt Bay, and it was not until 1897 that it was first visited by a Dutch missionary. During the years 1910 and 1911, the exploring party attached to the Dutch–German Boundary Commission investigated the lake and its surroundings. Four of that party, the leader, Captain Sachse, and three others, climbed one of the mountains, Mount Sinakob, but I failed to identify the peak.

The shallows of the lake are allotted to each village for fishing, and are dotted with fish traps, which consist of posts driven into the bed in circles about 10 to 12 feet wide. Fishing is specially women's work. Any kind of wood is used for the posts if not too rotten, and fish come to browse on the alga which grows on it. Several women combine to fish. One sees their long praus all over the lake whenever the weather is suitable, paddled by muscular women of all ages, laughing and chattering, and stopping to exchange gossip with occupants of other praus. Sometimes they surround the posts armed with sticks to beat the water while other women catch the fish inside the circle, but usually a large net is drawn round the posts. Inside the traps the fish are captured in small nets, tray-shaped, held stretched out with the hands in front while the back margin is tightened over the elbows by means of a drawstring. Each woman swims after a fish, scoops it up in the tray, and with a deft movement folds the net back against her chest, and rises to the surface hugging a wriggling fish to her breast. While at the traps the women have a humming song which is supposed to attract the fish, or else to reassure them.

I collected along the shores of Lake Sentani, but for this work had to hire a prau to take me to different points. There are trails in the villages but no continuous track right round the lake; the people depend upon their praus and all traffic is by water. Village groups communicate with one another but, although the inhabitants all call themselves Sentani people, they form separate clans. Two small villages, Jobi and Sisire, have little to do with the others, and pride themselves on the fact. Some communities are on friendly terms with certain mountain people: the natives of Pué periodically send a long distance to a remote village many miles inland, to buy a wife for one of their men. Formerly Sentani natives used to fight the natives of Humboldt Bay, but nowadays their relations are peaceable though each group shows an amusing contempt for the other.

For collecting aquatic species I had also to use a prau, and dredged in all the shallows for specimens. The bed of the lake where it is not muddy is covered with fragments of diabase, and serpentine, mixed with schists and quartz; and there appear to be only two species of aquatic plants in the lake

itself. The waters are well stocked with fish, including a shark and sawfish; some of these are marine forms which have become adapted to a fresh-water existence since the lake was cut off from the sea. There are several species of molluscs, a sponge which covers all rocks, weeds and submerged wood; and a crayfish whose larval forms swarm in the weeds.

Wishing to investigate the river which carries the overflow where it leaves the lake at the south-east corner, I put up for the night in Pué, which is the nearest village, and slept in one of the huts over the water. This river is the Tami, but at this juncture is named the river Djafoeri; about a mile down its course is a waterfall over 100 feet high which is the obstruction that effectively prevents marine forms from passing up to replenish the lake.

Near Pué the limestone hills close in, and force the river to swing westward at an acute angle before it ultimately finds a way between them, and after the fall makes a wide sweep through swamps to the north. At the corner where the hills baulk its passage is a series of small rapids. Here the current is so swift that even the brawny Sentani women find it too strong to paddle against and are obliged to wade and pull their canoes with their hands. I waded into the middle of the river and found that the rapids were caused by low terraces, the surface being of mud-conglomerate full of shells of fresh-water mollusca living to-day in the lake. The mud has solidified on the bottom, and I could not get at the basic rock structure to ascertain whether it was limestone. Embedded in the mud are large rocks of serpentine and diabase.

About the middle of September 1936, I left the Dutch Territory by prau for a coastal voyage of about 200 miles. All that coast is of unusual interest, but especially the part between Humboldt Bay and Aitape, which exhibits coral of many periods including living reefs. I travelled in a trading canoe belonging to the chief of Hollandia, who accompanied me himself with a crew of five boys as far as Aitape. We were singularly fortunate in experiencing a calm period, a brief interlude before the north-western gales began which herald the change in seasons. Usually we were able to go ashore in late afternoon, cook food, bathe and snatch a few hours' sleep; then utilize the calm hours of early night for paddling or sailing the next section. Twice it was too rough to land and we had to continue the voyage until the storm was over.

At Aitape Mr. Jock Marshall was waiting for a coastal steamer for Wiwak. Since this did not arrive we combined forces and hired a couple of canoes to take us down the coast in time to catch the Burns Philp steamer. I reached Sydney at the end of November and after a fortnight returned to England.

NOTES ON THE GEOGRAPHY OF THE TUNDURU DISTRICT OF TANGANYIKA TERRITORY

G. D. POPPLEWELL AND T. E. HARCUS

TUNDURU DISTRICT is situated along the central reaches of the Ruvuma River which marks the frontier with Portuguese East Africa. This position in the most southern part of the territory and half-way between the Indian Ocean and Lake Nyasa is one of transition between maritime and continental regions; the topography indicates the margin of the coastal zone, while the relief precludes the climatic and other features that characterize the littoral. The village of Tunduru has an altitude of 2198 feet. It lies in the centre of the district, which measures over 100 miles in length from east to west and covers a rectangular area of roughly 10,000 square miles. The latitude of Tunduru village is 10° S., and the longitude 38° E.

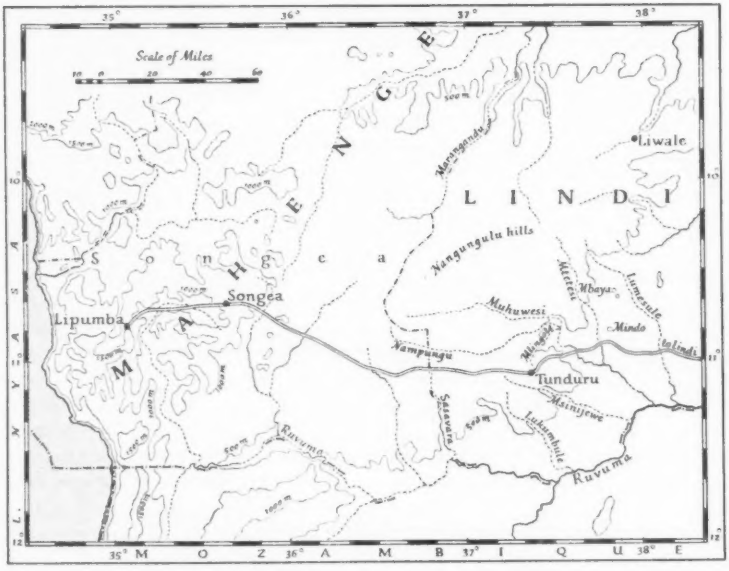
The term "district" is not without significance from the geographical point of view. The administrative boundaries follow topographical features: the Nangungulu hills in the north, and thence round the compass, the Lumesule, Ruvuma and Sasavara rivers. The northern hills form the watershed between the Rufiji and Ruvuma systems, and the two tributaries on the east and west flow parallel to each other in a southerly direction. The Lumesule is followed by the boundary throughout its entire length, and the Sasavara too, but this river, unlike the other, is not long enough to form the whole of this stretch of the boundary. Many small rivers are utilized, including in the north-west corner a headstream of the Rufiji, the Mbaragandu, which is followed for a short distance where it cuts into the watershed. These riverine boundaries would not in themselves be very suitable, were it not that they mark zones of almost uninhabited land. A game reserve occupies the eastern margin while the natives seem to avoid the country lying against the Songea District in the west. South of the Ruvuma in Portuguese East Africa there are no villages for a distance of 50 miles. The circuit of this zone of desert is completed by the Nangungulu hills for they also have no inhabitants in their higher parts. Contrary to expectation, the Ruvuma does not break this circuit, because the several falls of from 30 to 40 feet, the severe annual floods, and the perennially marshy plains on either bank, repel population and obstruct communication.

This dearth of population is not the result of purely physical agents. Although there exist many features in the soil or in the climate that discourage settlement—for example, the granite along the Songea border forms infertile soil and consequently the vegetation so important to the native is poorly developed; and in the vicinity of the Lumesule and south of the Ruvuma the land suffers from the aridity caused by porous sub-soil, low rainfall and intense evaporation—various human factors have also played an important part. Most of these operated in the past but the results they produced are still apparent. War and famine have caused large displacements of population, which superstition and prejudice have done little to rectify.

The bulk of the relief has been modelled out of the unaltered sedimentary

rocks that occupy the coastal zone. It is not only in the west however that the continental platform emerges to form the surface rock. The landscape in the Lumesule area is dominated by several isolated hills, or *inselbergs*, of peculiar conical shape, *e.g.* the Mbaya, Mindo and Namungu hills. They are made of hard knots of gneiss that have remained above the general level of the tilted crystalline floor to protrude through the sedimentary covering.

As a result of more than one cycle of erosion, there are many plateaus of different size and altitude on the soft horizontal strata. The main watershed in the north, the Nangungulu hills, is the highest of these plateaus, being well over 2000 feet. The plateau decreases in height eastwards until, at the head of the Lumesule, the ground is less than 1500 feet above sea-level. Of the rivers



The Tunduru District, Tanganyika Territory

that flow southward the Lumesule is the only one to reach the Ruvuma; the others, *e.g.* the Mihenje and the Mtetesi, are intercepted by the Muhuwesi, the most important tributary in the district. This river follows the general slope of the land, and flows diagonally across the district in a zig-zag course, there being two abrupt bends to the south where the river is joined in succession by the two tributaries mentioned. The Nampungu in the south is the largest tributary of the Muhuwesi, to which it flows parallel in a valley over 3 miles wide. Altogether, the Muhuwesi has over a dozen tributaries that are more than 30 miles in length.

The greater number of the rivers in the north and west points to a higher precipitation and a considerable amount of dissection. Among the hills which are for the most part flat-topped, there are many gullies, and lower

down precipices of from 50 to 150 feet in depth. These are cut in horizontal strata of reddish-coloured secondary sandstone. They do not however all form ravines; some separate plateaus of different altitude, and indicate a previous cycle of erosion. The interfluvial plateaus are greatly reduced in area where the valleys broaden downstream and their sides become less steep. There is thus a much greater variety in the topography.

In the east between the Lumesule and the Mtetesi, where precipitation is lower and streams less numerous, there is a broad dry plateau lying at a height of 1000 feet. This height increases northwards towards the Nangungulu hills, where the source region of the Lumesule is an impassable swamp during the greater part of the rainy season. But during the winter drought the plateau rapidly dries up owing to the porosity of the soil and the uninterrupted evaporation. In contrast, very little remains of this plateau in the south-east corner where the Ruvuma receives its principal affluents, which are now fully grown. Quaternary rejuvenation has produced some minor forms of relief and at the same time increased the unevenness and the complexity of topography in this small corner. Hence the land rises westward in gradual stages to form a waterparting 50 miles in breadth between the Ruvuma and the Nampungu. This plateau-like ridge, similar both in form and altitude to the northern divide, carries many rivers on its flanks. The Lukumbule is the largest of those in the south, while the small Mlingote draining into the Nampungu passes close by the village of Tunduru. The broad gentle eastern spur is dissected by the Msinijewe. The most prominent features of the relief are therefore the three watersheds between the Rufiji, Muhuwesi, Nampungu, and Ruvuma rivers. They merge smoothly on to the granitic massif to the west.

The broadest lowlands are to be found in the valleys of the larger rivers. The Ruvuma valley has a breadth of several miles throughout, although many eminences are to be found in the western portion near the junction of the Sasavara. There is a good development of terraces, and many of the large islands that braid the river are above the normal flood level. Yet though the Ruvuma has incised itself recently to a depth of from 30 to 40 feet, considerable areas are rendered swampy for several months by the severe annual floods to which the river is subject.

Thus four main divisions can be discovered in the topography of Tunduru. There are the broad and damp plains bordering the larger rivers; the river terraces together with the more gentle slopes; the low plateaus or plains from 1000 to 2000 feet; and finally the high plateaus frequently bordered by steep descents.

Climate and vegetation

At Tunduru, latitude 10° S., the highest temperatures are recorded in November. Then for three months there is no sensible decrease, but as the sun moves into the northern hemisphere, the temperature falls until it reaches its lowest just after the June solstice. The nights at this time are frequently uncomfortably cold. During winter and early spring, from June to October, the South-East Trades prevail. They are rainless, for the relief is too low to cause condensation. With the advent of summer the wind veers to the north and brings heavy rains. The latitude is not high enough to cause

complete coalescence of the rainy periods, so that after the initial rains in November, which are usually very slight, there is a fresh sunny break until the second half of December when the monsoon proper sets in. The main rainy season is given the name *Kifuko*, which is common to all tribes of northern Portuguese East Africa and Southern Tanganyika.

It is unusual to have a very heavy precipitation on a single day, although this does happen. On the night of 27 to 28 December 1931, 131·50 mm. were recorded at Tunduru, while at the same place on the night of 11 to 12 February 1932, 120·50 mm. were recorded. Usually however rain falls steadily every evening and early night (sometimes in the early morning) for three, four, or five days at a rate varying from 10 to 40 mm. per day. Spells of dry weather intervene, lasting from one to ten days.

While the heaviest rain is experienced as a rule in late December and early January, more than half the total yearly precipitation falls during the first two months of the year. From March on there is usually a considerable drop in the fall. The natives describe the month of April as the beginning of the *Kiangsi* or dry weather.

MEAN MONTHLY RAINFALL AT TUNDURU FROM 1928 TO 1932 (IN INCHES).

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Nov.	Dec.	Annual Mean
9·93	10·54	6·93	2·76	0·55	0	0	0·06	0·13	1·61	7·11	39·7

In November there is no appreciable difference in the rivers: the rain merely soaks into the parched ground. With the heavy rains however the ground soon reaches saturation point, and the numerous watercourses fill rapidly to swell the rising rivers. At the end of the dry season the Muhuwesi and the Nampungu rivers are not more than 6 feet wide and 2 feet deep, but in early January (sometimes in the end of December, sometimes only in the end of January) the former flows almost 200 feet wide and 20–25 feet deep, and the latter, overflowing 20-foot banks, attains a breadth of 50 yards. The Ruvuma becomes a powerful river, sweeping everything before it over a front of from 100 to 300 yards. It completely submerges several of the large islands that braid its course during the drought, and the greater part of the lowest terrace is turned to swamp. If, as sometimes happens, there is a lull after the first of the heavy December rains, the main rivers decrease in volume until they are quite fordable at a depth of 3 to 4 feet. But with the return of the rains they rise once more to their flood level. They remain at this level throughout January and February, sometimes even March. Then with the lessening rain they begin to subside. In April the Nampungu and the Muhuwesi average 4 to 5 feet in depth, and by the end of May, 2 feet.

The lesser streams have an exceptionally rapid rise and fall of roughly 1 foot per hour. The Lumesule itself, whose rocky bottom is dry during the winter, can rise to a depth of 15 feet and a breadth of 50 feet, and yet be fordable again after three days. Communication however is seriously retarded during the rains and is impossible in many places. It is noticeable that the main Songea–Tunduru–Lindi route avoids the lowland by following the Ruvuma–Nampungu watershed.

For a variety of reasons, but mainly on account of its incidence, the appar-

ently moderate rainfall of 39·7 inches per annum can support only a poor vegetation of markedly xerophytic character. Acacias and grasses predominate over the greater part of the region; and it is only where soil conditions are abnormally good that timber of any commercial value is found.

Most of the older erosion surfaces, as on the main ridges and in the east, are clothed with close bush or *Mijombo* forest. Here, among a large variety of plants including the tangerine orange, the *Mzima* (*Terminatia sericea*) is sought after by the natives. Being termite resistant, it is used for building purposes. This forest alternates with the savanna grassland. Where porosity is excessive, poor grass and grey thorny scrub dispute the land with stunted specimens of evergreen shrubs and woody perennials. The most advanced forms of xerophytes are found on and around the peculiar inselbergs, where sparse greyish lichen-like grasses barely cover the sterile ground. The southern slopes of the Ruvuma–Nampungu watershed carry an open forest in which few of the trees reach a height of more than 20 feet. Redwoods and ebony are the most important, the latter being found on the black cotton soils. On several of the higher surfaces foliaceous woods are also found. Of these only a few are open: the majority contain undergrowth of varying density. Below the margin of the flood plains the vegetation consists of a heavy growth of tall grass and reeds that can withstand the swift summer floods. These plants, including the bamboo, are also found in swamps on terrace and plateau. The latter is very common on all the lower valley slopes.

The growth of vegetation naturally coincides with the rains. In April the grasses attain a height of from 8 to 12 feet, but from May on they dry off until the bush fires about four months later.

There appear to be two periods in which the bush blossoms, the main being in January after the heaviest of the rains, the second in May or June at the beginning of the drought. The cessation of plant growth for almost half the year emphasizes the poverty of the environment. The foliaceous forest, on the other hand, follows a different rhythm. Owing to the higher moisture content of the soil, growth is usually possible for over nine months. Some of the trees and plants flower in October, and the others during the light initial rains at the end of the year. These two periods are called respectively *Sake* and *Mitele*.

The poverty of the vegetation is to some extent due to the burning that takes place towards the end of the dry season. It is probable that most of the vegetation is of secondary growth. Insects too, like the ant, do a considerable amount of damage.

The honey bee and the tsetse fly play an important part in another respect, by influencing human activity. Their influence is even stronger than that of the larger mammalia, of which several species are found. These include the ape, baboon, monkey, pig, and elephant, the last being most numerous in the Lumesule area near the game reserve.

Population

The country round Tunduru therefore displays several distinct variations in vegetation as well as in relief. But while no one type of country is particularly suitable for human occupation, it is noteworthy that the different

types are generally found in close proximity to one another; only in a few places, as in the east or along the extreme south, does one type exist exclusively. This intricate arrangement of the various elements in the physical setting is vitally important to the primitive inhabitants, since it enables them to procure from their immediate surroundings the few but widely different materials which they require to support their independent mode of life. Were this variety less common in the environment of the Tunduru people—their social and economic relations are very poorly developed—the district could support only a much smaller or more wretched population than it does. Even as it is, there are not more than 50,000 persons in 10,000 square miles.

The flood plains and islands of the Ruvuma are very sparsely populated by a poor type of Bantu, the Wamatambwe, who eke out a precarious existence mainly by fishing and gathering. Relatively poor in physique and without any tribal organization, they have suffered in competition with stronger and more advanced tribes. Early immigrant groups of the Wayao and Wamakua have settled along the south-eastern slope of the Ruvuma–Muhuwesi watershed, and during the fifty or sixty years in which they have lived together there has been extensive intermingling. It was only when German intervention removed the threat of further invasion by the Wangoni, a powerful Zulu people, that they quitted the Ruvuma marshlands, whither they had fled from the south, and moved into their present more favourable but less defensible territory. The Yao element there must be distinguished from the more numerous tribes of rather purer stock which occupy the western half of the district and form the bulk of the population. These are newcomers, having entered the district in 1910–11 as a result of wars with the Portuguese. They bear the full title of Wayao Masininga, after the name of a hill on the borders of Nyasaland and Portuguese East Africa. They are organized under three chiefs, Utukulu, Mataka and Mtarika, who occupy respectively the country of the Upper Muhuwesi and the Lower Nampungu, the Upper Nampungu and the higher plateau between the Sasavara and the Ruvuma, and the north-western slopes of the Ruvuma valley. The lands of Utukulu and Mataka are partly separated by a wedge of a third, or rather fourth (for the Wayao-Makua may be regarded as being distinct from the others) people: the Wandendeuli who, like their neighbours, did not immigrate voluntarily. In their case the driving force was provided by the famine that followed the German reprisals in Songea for the Maji-Maji rebellion of 1906. Of the proud and energetic Wangoni there are several scattered groups as, for example, those in the vicinity of Tunduru village; but they are not numerous: the Germans almost exterminated them for the part they played in the rebellion.

There was however one peaceful immigration, that of the Wamakua, who are to be found very thinly spread over the whole of the country from the Mihenje and beyond the Muhuwesi in the north-east and east. In spite of the extensiveness of the territory they inhabit, they number only about one thousand, or one person per square mile. Formerly they lived on a hill, Majeja, just east of the Lumesule where they had sought refuge from the Wangoni. With the effective intervention of the Germans, these Wamakua crossed into the Tunduru district at the junction of the Mihume and the

Lumesule, some 15 miles north of the Ruvuma, in search of fertile soil for cultivation.

Settlements

While movements may be made *en masse*, the settled population is generally distributed over wide areas in small groups of one or more families, the size of the groups and the distance between each depending on the proximity of water, timber for houses and for manure, and land for fields. Considering how essential these three requisites are to the native, it is not surprising that, in spite of the tendency towards dissemination, vast stretches are uninhabited and the bulk of the population confined to those localities where variety is the principal feature of the landscape. The majority of the settlements are therefore concentrated along the margins of the plateaus or on the terraces overlooking a wet-season stream. Since deep wells and borings are unknown, the native relies on river water for part of the year, and for the remainder on shallow (hand-dug) wells in the river bed or on springs in the valley-side.

The major settlements along the plateau edges are naturally both linear in form and loose in structure. The natives build their huts side by side in groups of two and three, overlooking their fields which stretch down to the river banks. In a few valleys where the fertility of the soil is exceptionally uniform, the huts straggle for miles along the tops of the slopes, but it is only where they are sufficiently numerous and compact, as for example at the junction of two valleys, that they may be said to form villages. This linear type of village is common among the Wandendeuli and the Wamakua, and wherever the country is comparatively undissected. In the Yao country, on the other hand, the fuller development of river terraces provides much broader strips of land for agriculture. For this reason the typical village here consists of a cluster of huts surrounded by fields, and although the arrangement is more or less haphazard, it is compact. In both types of village there are no gardens round each hut.

The most serious obstacle in the establishment and continuance of a village is the primitiveness of the agricultural system, whereby natural fertility is exhausted after from three to five years' tillage and fields consequently are scattered over an excessively wide area in less than a score of years. There is thus a strong tendency for any village community to disperse, which is realized wherever the authority of tribal chief or village headman is no longer exercised. Under Mataka and Mtarika, where the central authority is fairly well respected, the villages remain compact, but under Utukulu, in whose territory moreover the soil is fertile only in scattered and irregular patches, the community is dispersed in family groups that straggle, it may be, over an area of 4 square miles. A similar state exists among the Wayao-Makua and in the region of the Msinijewe whither there has been a slight infiltration of Wamatembwe. In this broken country the families are dispersed at varying intervals, cultivating the fertile patches of valleys, with their huts perched above their fields. On the broader plateaus where the fertility or non-fertility of the soil is generally more uniform in any given area, the population is distributed in rather larger groups in which each family cultivates its own

patch. Each patch contains one to three huts grouped together and is separated from the next by 100 yards of bush.

The Wayao build their huts on a square framework of thin branches which they daub with mud to make walls, and thatch with bush grass bound with strips of split bamboo. The broad eave overhangs in front to form a verandah which decreases round the sides and at the back. A grass fence or wall encloses a small space in the rear where the food is usually cooked, either in the open or in a small thatched kitchen built into the farther side. By the way in which the supporting poles are made to tilt outwards from the edge of the verandah to the eaves, the Wayao display a knowledge of strains and stresses that is lacking among the other tribes. Yao ideas have been extensively copied, but large numbers of different tribesmen using similar materials continue to produce very inferior huts. Those of the Wandendeuli frequently have walls of mud and grass, while the feebly supported roof covers a very narrow verandah. In the absence of a courtyard in the rear, the food is cooked inside the hut.

Another type of dwelling is built for use during the wet season by those members of the community whose duty it is to protect the fields from the ravages of animals. These are guard-houses raised on stout poles 10 to 15 feet above the ground. Vertical or horizontal poles lashed together with bark rope and covered with grass form the walls, while the sloping roof is heavily thatched with grass and the bamboo floor supported by a framework of timber.

Agriculture

Owing to the presence of the tsetse fly throughout the whole district there are no sheep and practically no cattle. Most areas have a few goats, and in Tunduru itself several are killed each month for the Administrative Officer and the two non-official Europeans resident there. The vast majority of the native population is largely dependent on the cultivation of the soil for their livelihood. But since cattle and sheep are wanting, their system of agriculture is incomplete and ecobuage is practised everywhere.

There are four distinct types of cultivation, although the first is equal in importance to the other three combined. These types are as follows:

(1) wet season cultivation on plateau, terrace and valley slope, the latter areas being the most popular.

(2) dry season cultivation on flood plains and lowest terraces in the damp soil uncovered by the receding rivers. Crops resulting from this type are called *mbwera*.

(3) cultivation in wet soil which drains naturally but slowly during the dry season. This is the *ulambo*, or thick cotton soil on which cultivation closely resembles the previous type.

(4) wet season cultivation in marshes requiring artificial drainage. The natives give this type the name of *matimbe* (soil) *ya Mkoloro* (ditch), or frequently, just *mkoloro*.

With these four varieties of soil in close juxtaposition to each other, the activities of all tribes are, in the main, alike; and although slight variations occur in methods of cultivation and in crops, the same seasonal rhythm is followed.

With cultivation of some sort being actively carried on during both the wet and dry seasons, there are naturally few periods of continuous respite. Under normal conditions there are only two, and these, curiously enough, are in the months of March and August after the sowing periods in each season, for the sowing in the one follows immediately on the harvest in the other, and vice-versa. In August the natives usefully employ their time in preparing ground for new fields. Sometimes a start is made as early as June by the more industrious, but the majority wait until August before cutting down the wild vegetation and leaving it to dry out on the ground. If however, as frequently occurs, the felling of trees or brushwood is postponed until the following month, there is insufficient time for the material to dry out before the commencement of the November rains. Consequently the burning is incomplete and the wood ash obtained small in amount and poor in quality.

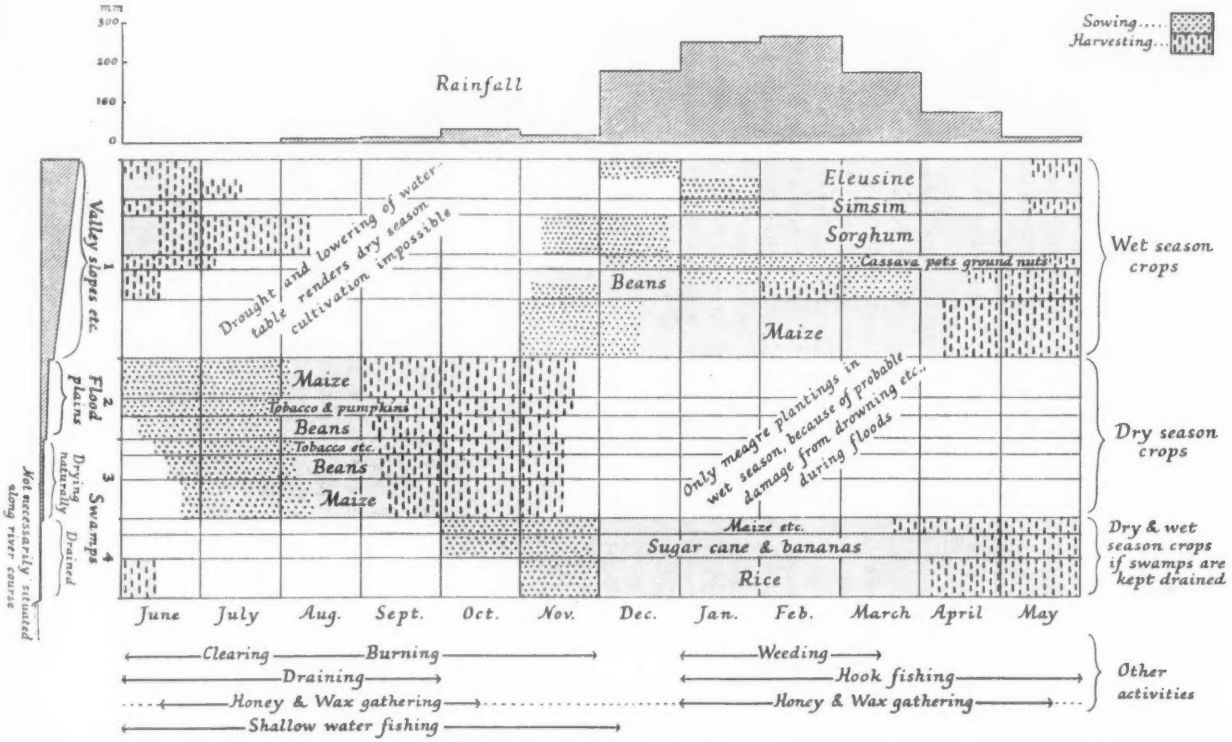
In this difficult environment any careless departure from the normal schedule may entail serious consequences and at least much additional labour. Thus when the main sowings are made only after the commencement of the heavy rains in December, weeds and seeds grow up together to the detriment of the latter. Likewise when fields are excessively cultivated, as many as six separate weedings are required.

The crops of the principal wet season cultivation consist of maize, sorghum, eleusine and kunde beans and, associated with the smaller of the millets, ground-nuts. These latter thrive best on the plateau and older alluvium or in new fields where plenty of ash has been stirred in. A rudimentary crop rotation is practised in the planting of new clearings with maize or sorghum in the second year. Maize however is generally confined to the lower terraces where it thrives best on the damper soil.

Among all tribes both sexes engage in the work of planting, the men making the hole and the women inserting the seed and covering it up. The Wandendeuli, Wangoni and Wamakua differ from the others in planting their crops comparatively late. This is not due to any dilatoriness on their part, but, on the contrary, to their economical practice of securing a second crop in the weeded spaces. Instead of attempting to dry and burn the weeds for ash, as some tribes do, they turn them into the soil, making ridges among the growing crops. These ridges are very fertile and can be utilized in January and February for late crops of maize and eleusine. The products of later weedings are reserved for next season's crops. In these late crops simsim is often an alternative to eleusine, and only very rarely are separate patches put under simsim. The main area for this crop coincides with the central reaches of the Muhuwesi and the Nampungu.

In February while the men are occupied in weeding and scattering seed, the women reap the kunde bean planted in November. On the patches thus cleared and in other parts sweet potato, cassava and bambara-nut are planted, the latter two being regarded, along with pigeon-pea, as famine crops. Indeed, as many crops of bean as possible are grown during the wet season. There are many varieties of bean, the one used depending on the preference of the tribe. All tribes however plant kunde.

Since the end of the drought the whole population has been more or less busily occupied in the fields but, with the coming of March, the work slackens



Agriculture of the Tunduru District

and the native can indulge his inherent love of travel. Although there are a few jobs of minor importance to be done, these are easily disposed of. The bean harvest can be left to the women, while the problem of protecting the fields against baboon, pig, and monkey can be left to the few adults who do not care for the rigours of bush life, together with the old men, women and children. Elephant are a different matter and in bad elephant areas, such as the Wamakua country on the Lumesule, few men can be spared.

The native occupies his holiday profitably in collecting honey and beeswax. This search goes on intermittently the whole year round and, although the flowering periods of December–January and April–June are the best, the March vacation provides an opportunity of pleasurably acquiring a rare amount of cash. The best area for honey and wax lies across the Ruvuma, as is shown by the fact that 75 per cent. of the wax bought by the Indian traders at Tunduru comes from there. The gatherings of local natives account for more than a third of this Portuguese wax. In Tunduru itself the best wax-producing areas are towards the west and the north in the uninhabited plateau country, in the game reserve, and in the south-east near the confluence of the Muhuwesi and the Lumesule.

On their return the natives find the maize ready for harvesting. The work is carried out chiefly by the women, and consists in the removal of the cob from the stalks which are left standing. The men remain in the village, building store-houses of cut poles or bamboo covered and thatched with grass. These maize-stores, which also function as kilns, closely resemble the guard-houses in plan, although the parallel poles in the floor are spaced about 2 inches apart in order to allow the entrance of smoke from fires built on the ground 10 feet below. After drying on the ground for a few days, the maize is stored in cob and with sheath intact. It is then smoked by a fire set between the four supporting poles, and preserved for an indefinite period. The original structure has, in many instances, been improved by walling up the supporting framework and filling the interstices in the sides with mud. The greater concentration of smoke thus obtained enables the construction of two or more storeys.

When the harvesting of the maize and bean crops is completed in the end of May, the natives begin on the sorghum, eleusine, simsim, cassava, potatoes, and the bambara-nuts. This harvest, following immediately on the other, is continued for over two months. The millets, especially the lesser, mature more slowly than the others so that it is generally July before they are gathered in. As much vegetable matter as possible is left on the ground as manure. The 12-foot stalks of the sorghum are first cut down by the men, and then, after considerable drying in the continuous sunshine, the heads are removed by the women in late July. The storage of this grain does not require the elaborate structure that is used for maize, but consists of a simple grass hut whose shape varies slightly according to the tribe concerned. The Wamakua favour a rectangular or square store, and the others one that is rotund or barrel-like. In all cases however the roof is conical and lifts off for the insertion of grain on to an interior framework of sticks which is raised about 1 foot from the ground. Some of these stores are, on the other hand, fitted with a door made either of bamboo or grass and fixed in position by a cross-bar. The

ground-nuts, after being dug up, are set on platforms of poles strewn over with grass and raised some 10 feet above the ground. When they have dried for a period of from ten to twenty days, they are either sold or stored in cylindrical bark bins.

April to July is a very busy time, for in addition to the harvesting of the main wet season crops, work is begun on the lower fields which have been inundated during the rains. In this cultivation the first plantings in each type are separated by a period of from a fortnight to a month in length, according to the rate at which excessive ground water drains naturally away. Maize plays a relatively more important part than on the higher ground, and with the virtual exclusion of the millets, the remainder of the land is devoted to tobacco, pumpkins, and more beans.

While the end of July sees the last of the sowing in the flood-plains as a whole, the swampier areas cause a prolongation into the following month. It is in this month however that under average conditions the native is comparatively free from either sowing or reaping. Although, as has been seen, the preparation of fields for wet season cultivation requires an amount of labour that is not insignificant, the native must turn to the riverine swamps where the soil is capable of producing rice, sugar-cane, bananas, and maize. The value of these food staples is sufficient to justify the time and labour which the native devotes to the cutting of drains and other ways of preparing the land for crops that may not survive the summer floods. Apart from the Ruvuma area however extensive damage is exceptional, and the value of these crops is enhanced by the fact that, being planted in moist soil in September, October, or November, they mature earlier than the others. Maize is the first to be harvested, in March; sugar-cane, bananas, and rice follow less than a month later. The same, or similar, stores may be used for both maize and rice.

During the dry season, and especially in August, the movement towards the rivers is not solely for the purpose of agriculture. Just as the gathering of honey and beeswax was an outstanding item in the native calendar for March, so in August there is another diversion in the form of fishing. Fishing, of course, goes on intermittently throughout the year, for it supplies an important article of food which in the absence of domestic animals is all the more necessary. In the pools and shallows of the rivers, notably the Muhuwesi and Nampungu, fish are caught in a variety of ways. The bamboo cage of cylindrical or conical shape is in common use; but where a number of men is available, fish drives may be organized. Armed with shields of bamboo plaited in criss-cross fashion, the natives advance in a continuous line with the two wings converging until a circle is formed. The circle is then drawn smaller and smaller by the gradual withdrawal of the wicker shields and their bearers. Eventually the volume of water enclosed is small enough for two or three natives to jump in and toss the captured fish to the others outside. Another method is to erect a broad circle of wicker shields in a shallow part of the river where the current is appreciable. Two openings are left in the circle: one faces upstream and the other, on the opposite side, is set with cages. After a while the entrance is closed and natives jumping into the ring scare the fish into the cages. During the rains however strong currents and

the presence of crocodiles in the Ruvuma and in the lowest reaches of the larger tributaries, are serious hindrances. Cages are used if suitable anchorage is obtainable, but there is in addition an ingenious arrangement of dams at the mouths of the smaller affluents wherein fish are trapped whenever the waters of the main river fall below normal flood level.

The interval between the sowing of the last and the reaping of the first of the dry season crops is at least a month shorter than is the case with the other crops. This more rapid ripening is due to the greater amount of insolation which the winter crops enjoy during the whole of their growth. Thus with the harvesting of the maize, beans, tobacco, and pumpkins in September, October, and November, the agricultural calendar is completed.

Native welfare

The present methods of land utilization impose a continuous movement on the population which, as the natural resources become increasingly exhausted in the course of time, will have a disastrous effect on native welfare. The most effective means of arresting this movement lies in the introduction of a more scientific form of agriculture. The task would be worth the effort, for once the population were stabilized and assured of an adequate food supply, an imminent danger would be removed and at the same time an opportunity provided for a gradual improvement in the commerce, society, and culture of the native.

Other factors contribute towards the present instability, but they are of secondary importance and might easily be removed by legislation. The Wayao, Wamakua, and Wamatembwe practise polygamy, in conjunction with a dowry system whereby the husband is forced to neglect his own cultivation and help for one or more years in that of his wife's parents. But, at this early stage in the development of the Territory, a great part of the legislation has been concerned with the development of the large plantations in the more favoured regions nearer the coast. In the case of Tunduru, the effect has not been helpful, for in order to pay the poll-tax, which was first imposed by the Germans, many natives are compelled to travel to the labour markets at Lindi, Dar-es-Salaam, or Tanga, and leave their families behind to fend for themselves for it may be five years. It was calculated that out of an estimated population of 13,000 adult male taxpayers in 1931, 4000 were at the coast, and that this is the total number absent in any given year.

The District offers few attractions to Europeans. At present only three are resident in Tunduru: one Administrative Officer and two traders.

This paper was written by T. E. Harcus from a report submitted in 1933 by G. D. Popplewell (Assistant District Officer at Singida, Central Province, Tanganyika Territory), in response to the questionnaire circulated by the Committee of the British Association on "The human geography of inter-tropical Africa."

AN UNPUBLISHED PORTOLAN CHART OF THE NEW WORLD, A.D. 1519

RICHARD UHDEN

THE oldest cartographical drawings of the New World may be divided into three groups. The first, and largest, represents the cartographical design of the newly discovered coasts within the frame of planispheres not exclusively based on the reports and maps of navigators, but in many cases containing the ideas of their compilers regarding the hypothetical outlines and the possible connections of the American countries with Eastern Asia. Characteristic of this group are the drawings of German and Italian cosmographers, such as the world-maps of Waldseemüller, Ruysch, and Contarini. There is another group of maps, which consists of manuscript representations mostly without hypothetical elements and generally indebted to Portuguese authors, *e.g.* those copied by Cantino and Canerio as well as the maps of Pedro and Jorge Reinel.

A third group, comprising special maps of the New World, must have been numerous in the sixteenth century, as has been stated in Harrisse's 'Cartographia americana vetustissima,' but few of them have survived. Among these is a portolan chart (see folding plate) cited on various occasions since 1882, but until now neither published nor described.[1] This chart (103.Aug.fol.) is in the Herzog August-Bibliothek at Wolfenbüttel. Of its provenance nothing is known, and I surmise that it was acquired by an agent of Duke Augustus the Younger of Brunswick-Wolfenbüttel (1579–1666), who purchased it somewhere in Italy or southern Germany for the famous book-collection of his employer.

This chart, measuring 89·5×67·5 cm., is drawn on parchment and was stretched on a wooden frame about forty years ago. Its state of preservation is on the whole good, save that some of the characters are rather faded and difficult to decipher. In addition, at the right margin the design is damaged by a series of damp-stains. The chart contains no mention of the author, but to judge from the form of most place-names as well as from the whole of its contents, it may reasonably be assumed that the cartographer was Spanish. The legends are in Latin, and along the coasts of Brazil the place-names are written in Portuguese.

The net-system of rhumbs is based on a central wind-rose on the equator, surrounded by sixteen subordinate wind-roses. The rhumb running through the centres of the north-eastern and the south-eastern wind-roses serves also as a scale of latitudes, extending from 31° N. to 28° S. The chart is also provided with a scale of miles bearing the figures 50, 100, 150, etc., up to 1000 and measuring 14·8 cm. On comparing the scale of miles with the scale of

[1] G. Uzielli and P. Amat di S. Filippo, 'Studi biografici e bibliografici, etc.,' 2nd ed., vol. ii, Rome, 1882, p. 106; H. Harrisse, 'The discovery of North America,' Paris, 1892, p. 502; S. Ruge in *Deutsche Geographische Blätter*, vol. xxiii, Bremen, 1900, p. 223; O. v. Heinemann, 'Die Handschriften der Bibliothek zu Wolfenbüttel,' sect. ii, vol. v, Wolfenbüttel, 1903, p. 192; W. Ruge in *Nachrichten von der Kgl. Ges. der Wiss. zu Göttingen*, Phil.-hist. Kl., 1904, p. 7.

latitudes it will be seen that the author reckons 70 *miliaria* to 1 degree.[1] It follows from this that the *miliaria* represent the measuring unit called by Hermann Wagner "romanische Seemeile" (1480 m.).[2] On carefully measuring various distances in the chart however it is evident that the mile possesses that value in two cases only, namely Florida and the continental coast between the island of Trinidad and the Punta Grossa (which is about the spot where, in the portolan chart, is written the name of "Costa de Paracara"). For the Lesser Antilles the length of the mile amounts to about 1300 m., whereas in the Greater Antilles and the Bahama Islands it is 1000 to 1100 m. Materially higher values for the lengths of the mile result for the South American coasts: over the distance between Cabo Stº Agostinho and Cananéa it amounts to 1700 m., and between the Punta Grossa and the easternmost promontory of the continent it even comes up to 2900 m., the latter distance having been disproportionately shortened.[3] The extraordinary differences in the amounts for the mile tend to show that the chart is based on a number of special maps of unequal scales, which have not been correctly utilized. It is therefore impossible to state a uniform scale for the chart under consideration. Adopting for the scale of *miliaria* the mile of 1480 m., the chart's scale would be approximately 1/9 M.[4]

An unusual feature of the chart is the orientation of Cuba. While in reality the southern coast of that island between Cabo de Cruz and Punta Caleta diverges only slightly from a west to east direction, it forms here an angle of nearly 20° with the parallel. This error occurs in a whole series of maps of the first half of the sixteenth century, *e.g.* in the Portuguese planisphere mentioned later, in that of Vesconte di Maggiolo (1527), and in the world-map of Robert Thorne (1527). At the first glance the assumption seems justified that the wrong orientation is a consequence of the declination, and, indeed, some scholars have drawn from such peculiarities conclusions regarding the declination prevalent in American waters during the Age of the Discoveries.[5] A similar method of determining the secular variation of an earth-magnetic element may, it is true, be applied advantageously to the portolan charts of the Mediterranean. However a closer scrutiny of the chart under examination shows how problematical it is to subject the early maps of the New World to this treatment. It is apt to lead to entirely wrong conclusions. For instance, the Island of Isabella shows merely a very slight deviation from the true orientation, whereas the eastern coast of Yucatan, whose real direction

[1] It must be noted here that the scale of latitudes is somewhat deficient in accuracy, as the distance between the equator and 10° north latitude amounts to 11·2 cm., whereas that between the former and 10° south latitude covers 11·5 cm. In comparing it with the scale of miles I have chosen the latter figure.

[2] "Zur Geschichte der Seemeile," in *Annalen der Hydrographie*, vol. xli, 1913, p. 397.

[3] A similar disproportion occurs in the anonymous Italian portolan chart of 1513, which belongs to the rare maps with the name "Antiglia" for the American continent, and has been published in this *Journal* (36 (1910) 128) by J. Denucé.

[4] W. Ruge (*loc. cit.*) determines the scale as 1/9·5 M. But that value has been erroneously fixed owing to a mistake in the scale of miles overlooked by him: in the numbering the figures 500 and 550 were left out by an error, so that the entire scale, instead of 1000 *miliaria*, only contains 900 in reality.

[5] *Cf. e.g.* F. Nansen, "Die magnetische Abweichung im Anfang des 16. Jahrhunderts," in *Petermanns Mitt.*, 1912, vol. ii, pp. 8 *et seq.*

is N. 15° E., in this chart shows a direction of N. 60° E., a value diametrically opposed to the deviation of the southern coast of Cuba.

The position of the equator in the Wolfenbüttel chart corresponds to that given in other cartographical designs of the first quarter of the sixteenth century, viz. it is placed approximately eight degrees too far to the north, and it is only in the world-maps of Diogo Ribeiro (1527 and 1529) that the equator is correctly placed. The mistakes in the latitudinal position of the various regions decrease towards the north. The northernmost point of South America, Punta Gallinas, as fixed in this chart, lies nearly four degrees too far south, and Porto Rico more than two degrees too far south, whereas the southernmost point of Florida differs less than one degree from the correct latitude.

The entire representation of countries and islands in the Wolfenbüttel chart shows, in general and apart from the outlines of Brazil, the same portrayal as that of the Portuguese planisphere of 1519 or 1520 in Munich.[1] But it is beyond doubt that, for the following reasons, the latter map is older. Florida, in the chart under discussion, is depicted as an island, a fact which corresponds to the conception of Ponce de León, who sailed along the coasts of Florida in 1512, believing, according to Herrera, that the country discovered by him was an island.[2] The map of about 1515 ascribed to Leonardo da Vinci shows Florida in this form for the first time, whereas the Portuguese map indicates a continental coast called "Tera Bimini," agreeing in this respect with the map of Peter Martyr annexed to some copies of his 'Opera' (Seville, 1511) containing the first "Oceani Decas" and named, in this case, "Isla de beimeni parte." In the 'De Orbe novo Decades' (Alcalá, 1516) the region in question bears the denomination of "Boiuca" or "Agnaneo," indications which seem to prove, according to Harrisse, that Florida had been already reached twice before Ponce de León.[3] I however think it more probable that the statements of Peter Martyr were based on information obtained by the Spaniards from the Indians of Cuba and the Bahama Islands. Neither the above-mentioned Portuguese map, nor that of Peter Martyr, show anything resembling the characteristic form of the peninsula and, to all appearance, the contours of the coasts were drawn from very indefinite information. This region much occupied the minds of the Spanish navigators at that time.[4] It is therefore quite possible that the fable of the fountain of

[1] This map, which was formerly erroneously ascribed to "Saluat de Pilestrina en Mallorques," was published for the first time by F. Kunstmann ('Die Entdeckung Amerikas,' Munich, 1859, Atlas, pl. iv). Reproductions relating to the American part of this map are given by K. Kretschmer ('Die Entdeckung Amerikas,' Berlin, 1892, Atlas, pl. xii), and also in C. O. Paullin's 'Atlas of the historical geography of the United States,' Washington, 1932, pl. ii A, where it is wrongly described as "Maggiolo Map ca. 1519." Lastly, A. Cortesão ('Cartografia e cartógrafos portugueses, etc.,' vol. i, Lisbon, 1935, pp. 272 *et seqq.*) has studied this map, presuming Jorge Reinel to have designed it in Seville in 1519. In my opinion it may even be dated as early as 1518.

[2] Harrisse, *op. cit.*, p. 145. The representation of the island resembles the outlines of Florida on the Spanish Turin Map of 1523–25.

[3] *Ibid.*, pp. 140 *et seqq.*

[4] O. Peschel, 'Geschichte des Zeitalters der Entdeckungen,' 2nd ed., Stuttgart, 1877, p. 410.

youth existing in the land of Bimini which was reported by the Bahama Indians may account for the fact that these coasts appear in the maps before their discovery by Ponce de León had become generally known. Peter Martyr mentions that event for the first time in his 'Enchiridion' of 1520. In this connection it may be remarked that the curious continental land north-west of Cuba appearing first in the Cantino world-map and reappearing later on in the maps of Waldseemüller was, in former times, taken to be Florida. But in reality this design, according to the examinations by G. E. Nunn, is based upon conjectures about the eastern coasts of Asia.[1]

Moreover the delineation of the southern coasts of the Gulf of Mexico proves that the Wolfenbüttel chart must be of more recent date than the Portuguese planisphere, the author of which knew nothing of the discoveries of Juan de Grijalva in 1518. His knowledge ends with the farthest point on the western coast of Yucatan reached by Francisco Hernandez de Córdoba in 1517. From this consideration the Portuguese world-map, judged by its portrayal of the American countries, must be placed somewhat after the year 1517. The Wolfenbüttel chart however cannot be dated before 1518. Its author still lacks the knowledge of the discoveries performed by Alonso Alvarez de Pineda who, in 1519, sailed along the northern and eastern coast of the Gulf of Mexico between the most distant points reached by Ponce de León in 1512 and by Grijalva in 1518 respectively.

The chart is of particular interest for its delineation of the southern coast of the Isthmus of Panama, although only one name is inscribed in this part of the drawing, viz. "insula das perlas," due evidently to the reports of Balboa, who from the coast of Darien in October 1513 discerned the Archipelago of the Pearls, without however visiting it. Not far from this group of islands we find the following legend:

Ferdinandus Hispanie Rex cum vellet huius terre optimam cognitionem habere circiter quingentos expertos et rei bellice peritos viros in hanc terram misit vt diligenter omnia perquirerent qui cum circiter sexaginta milia passuũ introgressi inuenerunt aliud seuissimum et uelut immensũ mare cuius cursus undarum ab australibus plagis ad littora voluebatur vnde clare liquet hanc terram minime esse continẽtẽ vt non nulli cosmographi voluerũt.

There can be no doubt that this report refers to the discoveries of Balboa, although the latter's name is not mentioned. According to this legend, the expedition consisted of 500 men, experienced in war, a number midway between the figures given by Oviedo and Las Casas, viz. 800 and 190.[2] The discovery of the great sea on the other side of the isthmus led the compiler to conclude that "this country is under no circumstances a continent as surmised by some cosmographers." These words, of which we should like to know whether they represent the opinions of the discoverers or of some Spanish cosmographer, disclose the author as a believer in the insularity of the countries north of South America, for it may be assumed that the expression "hanc terram" merely refers to the region of the isthmus, and not to the mass

[1] G. E. Nunn, 'The geographical conceptions of Columbus,' New York, 1924, pp. 90 *et seqq.*

[2] Peschel, *op. cit.*, p. 370.

of lands between the Archipelago of the Pearls and the coasts discovered by the Portuguese.

At the beginning of the sixteenth century, entirely different theories had been prevalent. At that time, most cosmographers believed in the existence of a single continent on the western hemisphere stretching from the arctic circle to the South Pole.[1] In Juan de la Cosa's world-map an uninterrupted coastal line seems to connect the countries discovered by Cabot, Columbus, and Cabral. More than a decade later, the map of Waldseemüller in the Ptolemy of 1513 is founded on the same idea. But as early as 1506, in the planisphere of Contarini, *i.e.* the first printed representation of the New World, there is not the slightest trace of a North American continent. In the middle of the second decade of the sixteenth century the majority of geographers tended to believe that the coasts north of the Isthmus of Panama belonged to a series of more or less extensive islands. As an example I need only mention the globe of Johannes Schöner of 1515. In the Wolfenbüttel chart the region now comprehending the states of Panama, Costa Rica, Nicaragua, and Honduras forms, as it were, a peninsula of South America, whereas Yucatan appears as an island, and there is no connection whatever between the coast discovered by Grijalva and the neighbouring countries. The author of the map seems to assume that a channel south of Yucatan leads into the ocean discovered by Balboa and that the region where rises the *s[ierra] neuata* is part of an island. On this hypothesis we can understand the singular legend running as follows: Oceanvs · occi · qvi cvm meridionali coivngitur. We might have expected to find in this legend the name "Oceanus Orientalis," as it occurs on the globe of Schöner. But it is evident that the author takes the ocean discovered by Balboa to be merely a continuation of the Atlantic Ocean, which in its part north of the equator used to be called "Oceanus Occidentalis" by most cosmographers of the first quarter of the sixteenth century. In other words, the eastern part of the Pacific Ocean is, according to the author's idea, by no means an independent sea. The addition of "qui cum meridionali coiungitur" confirms this supposition. By the term "Oceanus Meridionalis" the cosmographers of the Renaissance used to refer to the Southern Atlantic Ocean or to the sea south of Africa. At any rate the expression in the latter sense had already occasionally been used during the Middle Ages [2] and has the same meaning in the world-map of Henricus Martellus (1489), in that of Bernhard Sylvanus (1511), and on the globe of Behaim. As far as I know, the Southern Atlantic Ocean is for the first time definitely called "Oceanus Meridionalis" in one of the three map-sketches of Bartholomew Columbus (1503), and the name is equally to be found in the Portuguese planisphere mentioned above as well as in the Paris map of Pedro Reinel (*circa* 1522).[3]

The definite statement that the sea south of the isthmus communicates with

[1] Harrisse, *op. cit.*, pp. 109, 247.

[2] *Cf. e.g.* the Anglo-Saxon world-map in the Cotton MS. of Priscian's Latin version of Dionysius Periegetis in the British Museum. The ancient geographers did not use this expression. Authors of later epochs as Martianus Capella (§ 620) as well as the unknown geographer of Ravenna (pp. 5, 14; 443, 14), when referring to the sea south of Africa, call it "Oceanus Meridianus."

[3] Cortesão, *op. cit.*, vol. ii, pl. xi.

the "Oceanus Meridionalis" completely agrees with the ideas concerning the contours of South America as conjectured by the geographers of the second decade of the sixteenth century. On the globe of Schöner (1515) both oceans are connected by a channel, although the latter was not actually discovered by Magellan until five years later. It may however be remarked that the Wolfenbüttel chart is not the only one to denominate the sea discovered by Balboa as "Oceanus Occidentalis," since the globe gores of 1507 (said to be due to Waldseemüller) as well as the Green globe (1515), and also the set of globe gores edited by Ludovicus Boulengier (1515), all contain that name in the waters west of South America. Even Robertus de Bailly (1530) mentions it in the same place on his globe, although in this representation North and South America are not separated by a strait.

It appears that the drawing of the southern coast of the isthmus is based exclusively on the statements of Balboa and on the results of the voyage of Gaspar de Espinosa in 1517. As no names are inscribed along the coast it may be surmised that the three promontories signify the two capes of Azuero Peninsula and the peninsula between Rio S. Pablo and Rio Tabasara. The western of the larger islands may be Parida, the one in the centre Ceiba, and the third Cebaco, from which it further follows that the two archipelagos between Parida and Ceiba are the Islas Secas, and the small archipelago in front of the western peninsula is the Islas Frailes. The western part of the coast bears the inscription "Costa de Tamao," a name which is not mentioned in the same place in any other of the early maps of the New World, all the other maps of the sixteenth century regularly noting the region called Tamao on the eastern coast of the Gulf of Mexico. The map of de Pineda, which is but a little older than the Wolfenbüttel chart, locates the "Tamahox provincia" north of Rio Panuco. As a province that region is also mentioned in the map of Cortés copied by Peypus in 1534, in the Turin map of 1523, on a number of early globes, and in the world-map of Orontius Finaeus. Schöner and Maggiolo spell the above name "Tamacho," others, *e.g.* Franciscus Monachus, "Tamago," and again others, *e.g.* Sebastian Münster and Gemma Frisius, "Chamaho" and "Camaho." All these facts suffice to show that the designation in the Wolfenbüttel chart has, through a mistake, been put in a wrong place. It is not one of the names first employed by Espinosa, but must go back to Grijalva. The true meaning of the name seems to be unknown; it is noteworthy however that names with the prefix *tan* or *tam*, signifying "place," are very characteristic for the country of the Huastecs.[1] The name is still contained in the present denomination of Tamaulipas, the north-eastern province of Mexico; hence it may be supposed that Tamao and Tamaulipas possibly stand for one and the same district. During his voyage in 1518 Grijalva sailed as far as the environs of Tampico, and, while sojourning in the Island of the Sacrifices, which is also mentioned in the chart, became convinced that the land before him was a continent.[2] In the extreme west there is the name "Rio. . . ." What follows is illegible, but may perhaps

[1] W. Lehmann in 'Festschrift, Eduard Seler dargebracht usw.,' Stuttgart, 1922, p. 304.

[2] G. F. de Oviedo y Valdés, 'Historia general y natural de las Indias,' part i, Madrid, 1851, lib. xvii, cap. xiv, p. 523.

be completed as Rio de Canoa or Rio Panuco. It was from this spot that Grijalva returned to Cuba, where he arrived on 15 November 1518. As the names written along the coast west of Yucatan are the latest in the Wolfenbüttel chart, its composition must be placed at the earliest in 1519, *i.e.* in the year when de Pineda explored the northern and western coast of the Gulf of Mexico.

The northernmost part of the continent, which bears the name "Castigla del Oro," a term dating from 1513, has the following legend: Dabaiba hic quedam Regina dominatrix cuius imperio plurimi populi finiuntur multi auri ditissimi.

The region of Dabaiba or Dabaybe is familiar from a number of maps and refers to the hinterland of the Gulf of Urabá in Colombia and to the district on both sides of the Rio Atrato which formerly bore the name Rio Dabaiba. The latest maps of Colombia show a place called Dabeiba in the western part of the Department of Antióquia. In that country the great mother of Gods, Dabaiba, used to be venerated; her temple was in Urabá.[1] In the note on the Wolfenbüttel chart however she is assumed to be the royal sovereign of gold-possessing peoples. The remark is certainly one of the earliest reports referring to the myth of the Amazons in connection with the South American continent, for it precedes by eighteen years the accounts of the realm of the Amazons in the environs of Bogotá given by Johann de Sanct Martín and Antonio de Lebrija.[2]

[1] H. H. Bancroft, 'The native races of the Pacific States of North America,' vol. iii, Leipzig, 1875, pp. 498 *et seq.*

[2] G. Friederici, 'Die Amazonen Amerikas,' Leipzig, 1910, pp. 18 *et seq.*

THE NYASA-SHIRE RIFT

F. DIXEY

IN an earlier volume of this *Journal* I gave a preliminary account of the Nyasaland section of the Great Rift Valley,[1] and it may be of interest at this stage to review subsequent observations in this region and to trace their bearing on the views then expressed as to the age and development of the Nyasa-Shire rift, which forms a notable feature in the majestic scenery of this part of central Africa. These later observations refer chiefly to the northern end of the Nyasa rift, the neighbouring and almost parallel Luangwa valley lying to the west, and the region traversed by the Shire rift.

The Nyasa-Shire rift, forming part of the Rift Zone of eastern Africa, extends throughout the length of Nyasaland from north to south. The floor of the Nyasa rift is in part occupied by Lake Nyasa, which stands at 1550 feet but is in places over 2200 feet deep, with the result that parts of the floor lie more than 700 feet below sea-level. The Shire rift is traversed throughout by the Shire River, which forms an intermittent outlet, now active, from Lake Nyasa to the Lower Zambezi. The Nyasa rift and the greater part of the Shire rift are bounded by a high plateau ranging mainly from 3000 to 4000 feet in height, and this plateau, which is regarded as of Miocene age, is surmounted by a number of other smaller plateaus that attain to elevations usually of 6000 to 7000 feet, but sometimes as much as 8000 feet.

In the earlier paper referred to it was assumed, following the commonly accepted view, that the modern rift valley of this region was due essentially to the uplift and subsequent fracturing of the Miocene peneplain, although it was recognized that the then recently discovered early Cretaceous Dinosaur Beds within the northern Nyasa rift introduced a new factor. The presence of these beds led to the suggestion that the rift in this region had followed the line of early Cretaceous folds or other movements.

Later work on the Dinosaur Beds and corresponding formations of the Luangwa valley and the Lower Shire–Zambezi area has shown that these beds were originally developed to great thickness, and that the rift valley was infilled by them long before the Miocene peneplain was formed and uplifted. It follows therefore that features broadly corresponding to the Nyasa-Shire rift (apart from the deep basin in which Lake Nyasa lies), and the troughs of the Luangwa and the Middle and Lower Zambezi, existed as far back as the late Jurassic or early Cretaceous; moreover, they were due to late Jurassic or early Cretaceous faulting and other movements that locally rivalled or even exceeded in magnitude those of the late Tertiary.[2]

Furthermore, in the vicinity of, and in some cases directly overlooking, the Nyasa-Shire rift are relict uplands, already referred to, that were formerly

[1] F. Dixey, "The Nyasaland section of the Great Rift Valley," *Geogr. J.* 68 (1926) 117–40. See also A. R. Andrew and T. E. G. Bailey, "Geology of Nyasaland," *Quart. Journ. Geol. Soc.*, lxvi (1910), pp. 189–252.

[2] F. Dixey, "The early Cretaceous and Miocene peneplains of Nyasaland," *Geol. Mag.*, lxxiv (1937), pp. 49–67.

regarded as upstanding fault-blocks due to the Tertiary rift system. Recent work on the peneplains of this region has shown that these uplands, such as the Nyika, Vipya, Zomba, and Mlanje plateaux, standing mainly between 6000 and 7000 feet in height, and rising boldly out of the "4000-foot" Miocene peneplain, are actually remnants of a great end-Jurassic to early Cretaceous peneplain, and that their preservation is due to the presence of syenitic intrusions, quartzites, and other rocks sufficiently resistant to withstand the Miocene peneplanation. Certain of these uplands, such as the Nyika and the Mafingi, are in the main of even greater antiquity, since they form part of the rugged pre-Karroo landscape of this region.[1] In this connection it is of interest that Mr. Gerald Andrew has recently described from the Eastern Desert of Egypt a pre-Nubian topography comparable with the pre-Karroo topography of the north Nyasa area.[2]

Finally, it can now be shown that the instability that gave rise to the Nyasa-Shire rift, and probably also the Rukwa and Tanganyika rifts, can be traced back even beyond the early Cretaceous, since these features to a considerable extent are coincident not only with Karroo basins and early post-Karroo rifts, but also with ancient pre-Karroo lines of weakness.[3]

It may therefore be of interest to set out in somewhat greater detail the bearing that these considerations have upon the history of the Nyasa-Shire rift. It would seem that the hitherto accepted explanation as to origin by the relatively simple uplift and fracture of the Miocene peneplain has to be considerably modified so as to include, amongst other factors, preliminary uplift, fracture and erosion of an early Cretaceous peneplain along lines subsequently followed by the post-Miocene movements.

It may be added that although the rift-zone fractures elsewhere in eastern Africa are usually regarded as of late Tertiary age,[4] certain volcanic rocks in part of the Tanganyika area affected are considered to date from the Cretaceous,[5] while the Lupata early Cretaceous lavas of the Lower Zambezi,[6] are also associated with what are now taken to be the earlier rift movements in this area. Furthermore, Mr. E. J. Wayland considers that the Rift Valley faults of Uganda are very old indeed, and that they were rejuvenated in late Tertiary and Quaternary times,[7] while Mr. Gerald Andrew has described pre-Miocene topographical features of a part of the Red Sea coast which had previously been described as folded in post-Miocene times.[8]

[1] F. Dixey, "The Pre-Karroo landscape in the Lake Nyasa Region, and a comparison of the Karroo structural directions with those of the Rift Valley," *Quart. Journ. Geol. Soc.*, xciii (1937), pp. 77–96.

[2] *Bull. de l'Inst. d'Egypte*, xix, 1937, pp. 93–115.

[3] See note 1, p. 51.

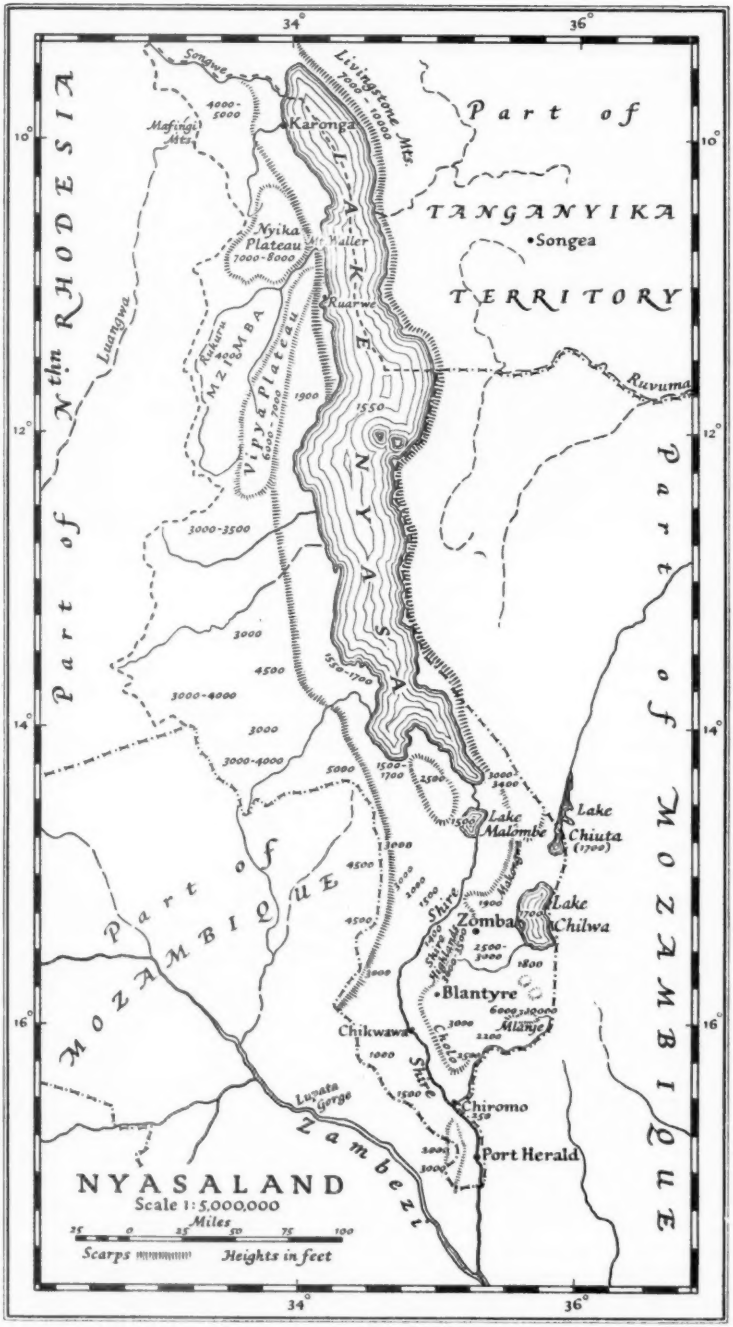
[4] A. L. Du Toit, 'Geology of S. Africa.' London, 1926. H. B. Maufe, "Some factors in the geographical evolution of S. Rhodesia and neighbouring countries," *S. Af. Geog. Journ.*, xviii (1935), p. 3. A. C. Veatch, 'Evolution of the Congo Basin,' Mem. 3, Geol. Soc. America, 1935.

[5] E. O. Teale, 'Outline of the geology of Tanganyika Territory,' Bull. No. 6, revised, Geol. Surv. Tanganyika Territory, 1936.

[6] F. Dixey and W. Campbell Smith, "The rocks of the Lupata Gorge and the north side of the Lower Zambezi," *Geol. Mag.*, lxvi (1929), pp. 241–59.

[7] *Geogr. J.* 83 (1933) 95.

[8] *Bull. de l'Inst. d'Egypte*, xvi, 1934, pp. 47–59.


34°
36°
10°
12°
14°
16°
Part of Nthn RHODESIA
Part of TANGANYIKA TERRITORY
Part of MOZAMBIQUE
Part of MOZAMBIQUE
Songwe
Livingstone Mts.
7000-10000
Karonga
Mafingi Mts.
4000-5000
Nyika Plateau
7000-8000
Mt. Waller
Ruarwe
Luangwa
Kaluzwa
MZIMBA
4000
Vipya Plateau
6500-7000
1900
1550
Songea
Ruvuma
3000-3500
3000
4500
3000-4000
3000
3000-4000
5000
1500-1700
2500
3000
3400
1550-1700
NYASA
Lake Malombe
1500
Lake Chiuta
(1700)
3000
4500
3000
1000
1500
Shire
Zomba
1900
Lake Chilwa
1700
Shire Highlands
1400
2500-3000
1800
Blantyre
6000-10000
Mlanje
3000
2200
Chikwawa
1000
Shire
1500
Lupata Gorge
Chiromo
250
Port Herald
200
300
Zambezi
NYASALAND
Scale 1: 5,000,000
Miles
25 0 25 50 75 100
Scarps
Heights in feet

The development of the Nyasa-Shire rift would accordingly appear to have taken place essentially along the following lines:

(1) The north Nyasa and Lower Shire rifts to a considerable extent cover the site of basins of Karroo deposition and of early post-Karroo movements, which themselves were influenced by still older structures.[1]

(2) These movements were followed by a thorough peneplanation culminating at the beginning of the Cretaceous, or even slightly earlier, when uplift, fracturing and tilting of the old surface took place. At some time shortly following the initial uplift, which was of the order of several thousand feet in the north and about 1300 feet in the south, a secondary peneplanation took place affecting only the softer gneisses and the Karroo sediments. At about this time was initiated the down-tilting of blocks against the Livingstone scarp, and also the Cholo scarp (between Chikwawa and Chiromo), with possibly concomitant uplift on the upthrow sides of the faults.

(3) The general uplift and associated fracturing continued, and it may be assumed that the intervening part of the rift between the northern and southern ends developed at this time, although no sediments have yet been found whereby the movements could be traced. Simultaneously erosion was taking place along the Karroo troughs and basins, as in north-west Lake Nyasa, the Lower Shire, the Luangwa valley, the Lower, and probably also the Middle, Zambezi, and elsewhere along the developing rift, with the production of great valleys ranging up to 5000 feet in depth.

(4) Then followed prolonged and gradual depression under arid to semi-arid conditions, whereby the early Cretaceous sea encroached upon the eastern and south-eastern coasts, and the great inland valleys referred to became filled with coarse waste, possibly derived in some cases from the still rising upthrow sides of the major faults. The earliest sediments in the north Nyasa trough and the Luangwa valley were the Dinosaur Beds, of early Cretaceous age; in the Lower Shire and the Lower Zambezi the comparable Lupata Sandstones accumulated in association with the Lupata Volcanic Series. In the eastern Cape Province the early Cretaceous Uitenhage Series (Enon Beds, etc.) was laid down under similar conditions in great intermontane valleys, while faulting and local uplift were still in progress.[2] The general depression and infilling of valleys and basins continued throughout the Lower and the Upper Cretaceous, and possibly the Eocene, and corresponding marine beds accumulated along the coast.

(5) More stable conditions finally prevailed leading to widespread peneplanation culminating at about the mid-Miocene. The base-levelling was complete however only on the softer rocks, and remnants of the early Cretaceous peneplain were preserved on areas underlain by resistant rocks, such as syenitic and granitic intrusions and the harder quartzitic and other schists. In consequence of the early Cretaceous disturbances initiating the Rift Valley movements of this region, these remnants of the old peneplain still lie along the general course of the present rift; they include the Nyika plateau

[1] F. Dixey, "The geology of the Lower Shire–Zambezi area," *Geol. Mag.*, lxvii (1930), pp. 49–60. "The geology of part of the Upper Luangwa valley, North-Eastern Rhodesia," *Quart. Journ. Geol. Soc.*, xciii (1937), pp. 52–76.

[2] A. L. Du Toit, 'Geology of S. Africa.' London, 1926.

Ruarwe headland, west shore of Lake Nyasa

Mount Waller, whose flat summit represents the 4000-foot Miocene peneplain at about 2500 feet above Lake Nyasa

Western end of Zomba plateau, standing at about 6000 feet and representing the early Cretaceous peneplain, with the head of the scarp overlooking the Shire rift valley

Chesenga village on 4000-foot Miocene peneplain at foot of Mafingi Mountains, whose summit at 7500 feet represents the early Cretaceous peneplain

and other highlands around the northern end of the Nyasa rift, the Vipya plateau, Zomba plateau, and the marginal Mlanje plateaus. The remnants of the older peneplain would appear to include also the ancient highlands surmounting the North-Rhodesian 4000-foot peneplain to the south, and the north, of Mpika (lat. 11° 50′ S.), where they rise above western edge of the Luangwa trough. This great relict-peneplain is clearly seen in the course of the air route from Mbeya to Broken Hill. Farther south, between the Zambezi and Salisbury, the same air route crosses the Hunyani and Umvokwe ranges, to which possibly a similar explanation applies.

(6) The Miocene uplift, of the order of 3000 to 4000 feet, led to the erosion of the Cretaceous sediments from the inland valleys and the coastal plains; sufficient of these sediments still remain however, as in north Nyasa, the Luangwa valley, and the Lower Shire–Zambezi area, whereby their former great extent can be ascertained.

(7) The uplift, like that of the early Cretaceous, was accompanied or followed by intermittent fracturing and local tilting of the peneplaned surface. In general, the faulting and tilting followed the lines of the earlier disturbances, but were probably less striking in their effects. The rift was deepened, although probably to a relatively small extent, and to these and later movements, as opposed to those of the early Cretaceous, are tentatively ascribed the subsidence, in stages, of part of the floor of the Nyasa rift from the level of the north-western lake plains (1550–1700 feet) to a maximum of about 700 feet below sea-level, so as to form the basin now occupied by Lake Nyasa; the subsidence of the floor of the Upper Shire rift to the extent of about 300 feet, as along the Makongwa scarp, with local down-warping to form Lake Malombe; depression of an uncertain amount, possibly of the order of a few hundred feet, along the foot of the Cholo scarp, and southwards, to form the elongated alluvial basin of the Lower Shire River; and farther south, the Urema and Sabi troughs. Moreover east of the Shire rift the gently down-warped Miocene peneplain of the eastern Shire Highlands is overlain by a great sheet of sediments, probably some hundreds of feet in thickness, upon which rests the broad and shallow Lake Chilwa. In the exposed upper part these sediments are only of recent age.

(8) Along the north-western shores of Lake Nyasa the cycle of deposition, tilting and erosion was several times repeated in late Tertiary and Quaternary times; minor parallel rifts developed, with intermittent subsidence combined with tilting in the one direction, namely towards the floor of the main rift and the Livingstone scarp.[1] End-Tertiary or early Pleistocene sediments rest with strong unconformity upon unfossiliferous, presumably Tertiary, sediments, and these, also with strong unconformity, upon the early Cretaceous Dinosaur Beds. Volcanic rocks of Pleistocene age are well represented in this part of the rift.

(9) On the Sheringoma plateau, south of the Lower Zambezi, end-Tertiary

[1] F. Dixey, "The Nyasaland section of the Great Rift Valley," *Geogr. J.* 68 (1926) 117–40; "The Tertiary and post-Tertiary lacustrine sediments of the Nyasan Rift Valley," *Quart. Journ. Geol. Soc.*, xxxiii (1927), pt. 3, pp. 432–47; "The Dinosaur Beds of Lake Nyasa," *Trans. Roy. Soc. S. Africa*, xvi, pt. 1, pp. 55–66.

marine sediments rest directly on Eocene marine sediments,[1] the interval doubtless representing the mid-Tertiary disturbances of the interior. The younger sediments now stand at 1100 feet above sea-level, and have to this extent taken part in the Pliocene uplift affecting not only the rift zone, but also the greater part of the African continent.

In the region traversed by the Nyasa-Shire rift there was thus an overlap of the lower and middle Cretaceous movements of southern Africa with the late Tertiary rifting of eastern Africa, and both would appear to have been influenced to an appreciable extent by still older structures.

The Nyasa-Shire rift would accordingly appear to date mainly from the uppermost Jurassic or early Cretaceous, with renewed movement in the late Tertiary and post-Tertiary. Furthermore, it may be concluded that in this region old lines of weakness determined in Karroo times, and even earlier, have influenced successive later movements to a considerable extent, and that the more striking topographical features of the present day are due as much to repeated concentration of movement along old lines as they are to the rift movements of Tertiary and post-Tertiary times.

[1] F. P. Mennell, "Some Mesozoic and Tertiary igneous rocks from Portuguese East Africa," *Geol. Mag.*, lxvi (1928), pp. 529–40.

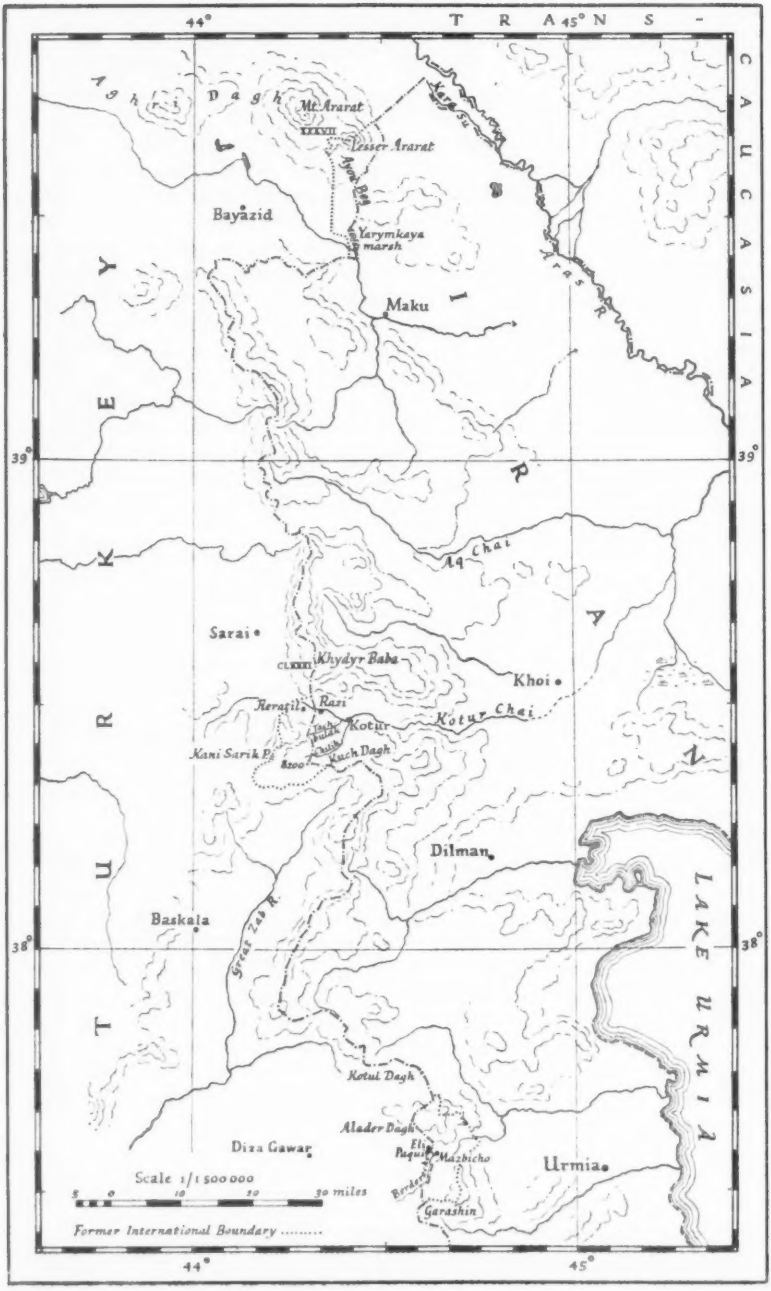
THE TURKISH–IRANIAN BOUNDARY

WE have received through the courtesy of the Foreign Office a copy of the text of the Turkish–Iranian agreement, May 1937, relating to the rectification of the boundary between the two states. To place this agreement in perspective, it is necessary to refer briefly to the history of this boundary. By the terms of the Treaty of Erzerum, 1847, a commission of British and Russian officers carried out a survey of the frontier zone between Turkey and Persia, the demarcation of the boundary being left to the two powers concerned. For various reasons, nothing more was done for many years, until in 1913 it was agreed by the Protocol of Constantinople that a commission representing the four Powers interested should demarcate the boundary. An account by Colonel C. H. D. Ryder of the work of this Commission was published with a sketch-map in the *Journal* for September 1925 (66.227). In January 1932, Turkish and Iranian plenipotentiaries, who had been appointed to "fixer définitivement la ligne frontière," signed an Accord, delimiting the boundary and agreeing to the appointment of a demarcation commission.

This Accord of 1932 accepted in great part the boundary demarcated in 1913–14. No mention however is made in the text to the earlier Commission, though there is reference throughout to the maps it produced on the scale of 1 : 84,000 and 1 : 50,000, and upon which the rectifications were delimited. There are three chief differences between the 1914 and 1932 boundaries, in the portions (*a*) south-east of Mount Ararat, (*b*) west of Kotur, undemarcated by the 1914 Commission, and (*c*) west of Urmia. It appears that this agreement was largely a recognition of existing conditions, for, on consulting the Quarter-Inch sheets of the Survey of India, it will be seen that the greater part of these three areas were already held by the state to which this agreement allotted them.

The Mount Ararat region. The most northerly point of the 1914 boundary was on the col between Mount Ararat (Büyük Aghri Dagh) and Lesser Ararat (Küçük Aghri Dagh), a point also common to the Iranian–Russian boundary, which ran eastwards to the Aras. By the Russian–Turkish treaties of March and October 1921 however the area to the north passed to Turkey, so that the Turkish–Iranian boundary was thus extended from Lesser Ararat to the Aras. This boundary therefore, as delimited in 1932, begins on the east at the junction of the Aras and the Kara Su, and coincides with the former Russian–Iranian boundary to a point 6·4 km. north-east of the summit of the Lesser Ararat. There it departs approximately in a south-easterly and then in a south-westerly direction, to rejoin the 1914 boundary some 17 miles to the south. The boundary thus leaves the greater part of Lesser Ararat and the tribal camping grounds on the south to Turkey, runs along the crests of the Ayou Beg, and divides the Yarymkaya marsh, the total area recognized as Turkish being about 60 square miles.

Kotur region. The boundary west of Kotur, between Khydyr Baba (pillar CLXXI of the 1914 Commission) and Kuch Dagh to the south, was not demarcated in 1914. By Article LX of the Treaty of Berlin, 1878, Turkey



The Turkish–Iranian boundary

had agreed to cede to Persia the town and territory of Kotur, as fixed by a mixed Anglo-Russian commission. The boundary was delimited in the Protocol of 1880, which was conditionally accepted by the powers concerned, but never demarcated. The line then proposed (shown as undemarcated on the Tabriz sheet of the Million Map) formed a salient into Turkish territory, placing the localities of Razi and Heratil in Persia and passing by the Kani Sarik pass. The 1932 boundary however runs in a general southerly direction to summit 8200 of the 1914 survey and thence eastwards to Kuch Dagh. It therefore is now about 5 miles to the west of Kotur, crossing the Kotur Chai at its junction with the Heratil Su and leaving the upper valley of the Chilik Chai in Turkey.

Urmia region. The boundary west of Urmia from the Kotul Dagh to the western summit of the Garashin was rectified in favour of Iran. The locality of Mazbicho was recognized as Iranian, and to the south the boundary was advanced in part to the thalweg of the Ekmaluk and Berdéré chai. The area involved was approximately 35 square miles.

Rectification of May 1937. This minor rectification dealt with a portion of the boundary near Mazbicho. The area is not completely covered by the 1914 survey, and, without a copy of the sketch-map attached to the Accord, it is not possible to follow the change in detail. A comparison of the passages in the two documents shows that it cannot be considerable. In the 1932 Accord, the passage is: "[From Alader Dagh] it runs towards the south-east by the crests to the summit 2400 metres north of the junction of the stream coming from Paqui with the Berdereche Tchay. Thence the line runs southwards to this junction; then it follows the Thalweg of the Berdereche Tchay to its junction with the torrent. . . . The localities of Eli and Paqui remain in Turkey, that of Maz Bicho in Persia." The 1937 agreement reads: "[From Alader Dagh] it runs towards the south-east by the crests to the summit of Tapei Hochap, *côte* 2800, where the boundary stone No. 476 is placed, and from Tapei Hochap it runs in a straight line to the river coming from Paqui, to rejoin this at the point marked upon the attached sketch-map signed by the two parties, which is approximately 50 metres north-west of Mazbicho, and from this point it follows the Thalweg of the said river to its junction with the river Berdereche Tchay. Then it follows the Thalweg of the Berdereche Tchay to its junction with the torrent. . . . The localities of Eli and Paqui remain in Turkey, and that part of the locality of Maz Bicho lying east of the river coming from Paqui in Iran."

From the concluding statement it appears that the Maz Bicho mentioned is to be identified with the Deir Marbishu of the Quarter-Inch sheet, shown just west of the river junction, and with the Maz Bicho of the 1914 survey half a mile to the east of the junction. The Quarter-Inch sheet also shows a Marbishu two miles to the east. G. R. C.

REVIEWS

EUROPE

THE GEOGRAPHY OF EUROPE. By GEORGE D. HUBBARD. (The Century Earth Science Series. Edited by KIRTLEY F. MATHER.) *New York—London: D. Appleton-Century Co.*, 1937. 9×6 *inches;* xii+876 *pages; illustrations and maps.* 21*s*

This is the fruit of the author's long teaching experience at Oberlin College, and of European travel during a sabbatical year. It aims at providing a comprehensive and balanced text for the advanced student. There is a short introductory section of less than fifty pages, treating mainly of physical geography, and then over seven hundred pages are devoted to descriptive geography of European countries, grouped by the familiar Continental scheme into Mediterranean, Atlantic, Baltic, Russian, Central European, and Danubian Lands. There is a conclusion entitled "Geography in the fourth dimension," which briefly surveys the origins and evolution of agriculture, commerce, and civilization.

As to the extent to which Professor Hubbard has achieved his object, the present reviewer must confess to a certain disappointment. Apparently the author has been unable to make use of original sources, for the end-of-chapter bibliographies contain as a rule only English references, many of them to text-books and magazine articles rather than to treatises, monographs, and papers. That incomparable achievement of French scholarship, the 'Geographie Universelle,' is cited only in connection with Rumania. German scholars are barely mentioned in the Central European section. There is a general weakness in physical geography, and the maps especially are too few and poor. Repetition, misstatement, and slipshod expression occur intermittently, *e.g.* "Transhumance means 'across the humus' or soils and is derived from the French. When hunting was being replaced by grazing in the more open plains or old topography of Southern Russia, Poland, and Spain, the wanderlust was met by long treks twice a year with sheep and cattle" (p. 811). But despite these defects, there is much to praise. Many descriptions are vivid and clearly authentic, with a wealth of significant detail. The illustrations are carefully chosen, well reproduced, and serve their purpose admirably. In short, a discerning Honours student will find useful supplementary reading herein, but is not likely to adopt it as his fundamental text-book. J. H. G. L.

BUCKS. By JOHN NASH. 46 *pages.* NORTHUMBERLAND AND DURHAM. By THOMAS SHARP. 54 *pages.* HAMPSHIRE. By JOHN RAYNER. 64 *pages.* (Shell Guides.) *London: B. T. Batsford*, 1937. 9×7 *inches; illustrations and maps.* 2*s* 6*d each*

These are Nos. 8, 9, and 10 of a series being published at the rate of about three a year, of which Cornwall, Devon, Dorset, Somerset, Wilts, Derbyshire, and Kent are the predecessors. They are handy books of about fifty double-column pages, neatly bound in various-coloured celluloid, so that they can be bent back without damage. Topics, *e.g.* persons and places, are treated alphabetically, and there are plenty of illustrations, and coloured Bartholomew maps to a scale of 5 inches to a mile. The production is not uniform: thus, of the three guides before us 'Hampshire' is in a good legible type, the other two having print rather small for quick reference in a motor-car. Dealing with so wide an area in so few pages, the guides must obviously be very selective and to the

point. For style, the somewhat forced journalistic liveliness of 'Hampshire' will perhaps please some, with its coinage of words such as "architexpert," and "Danebury is a must." 'Buckinghamshire' is in a more sober and pleasant style, and Mrs. K. Esdaile's contribution on English sculptured monuments in the churches of the county is a valuable asset. 'Northumberland and Durham' are treated in one volume, which naturally shows rigorous selection and compression. The writer quite properly has determined to show "something at least of the shameful ugliness and social decay of some of its parts, as well as the delight and beauty of others. . . ." A feature of this volume is some telling pencil drawings by A. E. Newcombe, and there is an impressive two-page photograph of the Roman Wall, of which a good short account is given. The Roman name of Carrawburgh was Procolitia, not Procolita (p. 14). S. E. W.

THE FACE OF IRELAND. By MICHAEL FLOYD. *London: B. T. Batsford*, 1937. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* viii + 120 *pages; illustrations and map.* 7*s* 6*d*

Mr. Floyd, avoiding as far as possible historical questions and literary associations, has concentrated upon the less controversial, but still difficult, task of describing the scenery of Ireland and accounting for its appeal to the observer. If he analyses its constituents somewhat prosaically into hills, moors, pastures, and water, he is aware that the dominant factor is the rapidly changing and varied effects of the atmospheric conditions, but, perhaps wisely, for the subject would challenge the most skilled pen, he confines himself to referring to this in general terms. His enthusiasm, backed by a wide first-hand acquaintance with the Irish countryside, should stimulate the visitor to Ireland to break away from the conventional itinerary. The book is largely designed for the motorist, who will find in its six chapters sufficient to enable him to plan a tour to his individual taste. There are naturally minor gaps in the itineraries, but these remain for the visitor to discover for himself. The excellent and varied illustrations, mainly the work of Mr. W. F. Taylor, form perhaps the most successful attempt adequately to picture Irish scenery that has so far been published.

G. R. C.

GEORGIAN YORK; a sketch of life in Hanoverian England. By R. GRUNDY HEAPE. *London: Methuen & Co.*, 1937. $8\frac{1}{2} \times 6\frac{1}{2}$ *inches;* xii + 120 *pages; illustrations.* 7*s* 6*d*

The performance of this book does not fulfil the promise either of its title or sub-title. It has no exclusively local association and its interpretation of "life" is narrowly conceived. It is in fact a collection of rather disorderly notes upon the upper and middle-class society of the eighteenth century, strung together by not infrequent references to the metropolis of the North. Mr. Heape concedes most space to the drama, giving a detailed account of Tate Wilkinson, manager of the York Theatre from 1766 onwards, and much incidental information about the stage in general. Much attention too is devoted to architecture. The importance of Lord Burlington's patronage, which resulted (besides other things) in the erection of the public buildings of York, is duly emphasized; but the work of that interesting figure, John Carr, the mason, who designed the Grand Stand on Knavesmire, is considered rather more fully. The last pages of the book are reserved for the unpublished correspondence of Richard Chicken, a broken-down actor and begging-letter writer of the eighteen thirties. Their charming dignity (and impudence) perhaps compensate for their triviality and justify their inclusion.

The rest of the book deals with the clothes, food, and follies of the *beau monde*. There is a chapter on Laurence Sterne and another on Mrs. Elizabeth Montagu.

The household accounts and bills of fare of the daughter of a North Riding squire, which have already appeared in print, are set out at length. There is however no mention of the life of the poor, of municipal government, or of local industries.

The narrative lacks connection; we spring without preamble from stage-craft to false teeth, from turnpikes to Wilkinson's 'Memoirs.' Too many of the many anecdotes deserve to be forgotten, but the best are of a kind to furnish footnotes for 'The Complete Peerage'—whence perhaps they come.

R. B. P.

EISZEITLICHE UND REZENTE VERWITTERUNG UND ABTRAgung im ehemals nicht vereisten Teil Mitteleuropas. By JULIUS BÜDEL. (Petermanns Mitt. Ergänzungsheft Nr. 229.) *Gotha: Justus Perthes*, 1937. 11 × 7½ *inches;* 72 (+12 *plates*) *pages; illustrations. M.*10

This is a study of the criteria available for the discrimination of peri-glacial weathering, better known in this country and in France as solifluction and tacitly assumed to be the result of glacial climate. Of the field work described, both studies were made in mountain regions where the effects of slope and altitude were investigated. Other factors such as nature of rock, exposure, and ground water were also considered, but the phenomena were in the main found to be climatic in origin. The most interesting sections were discovered in the Riesengebirge, where boulder-spreads (*Blockmeere*) are very common, forming the uppermost zone of a peculiar soil-profile, ½ m. to 1½ m. in thickness. Over the granite substratum follows a boulder-free zone of sandy granite debris, which still preserves the original granite structure. This passes upwards into a zone of contortion (*Hakenschlagen*). Thereon follows a boulder-bed with confused stratification, the blocks being mostly foreign to the immediate neighbourhood and obviously transported for distances up to 2 km. on slopes of 2° inclination. In some places a complete and undisturbed peat section, from the subarctic layers to the peat of the present day, overlies the disturbed soil. In others an unaltered podsol profile with ironpan is superimposed on the details of the section. The latter therefore has not moved since late-glacial times, and the appearance of soil-motion which it displays can be referred to the glacial period. At the present day there is only chemical erosion on the slopes and transport is confined to the streams.

At the foot of the mountains are wide gravel spreads, often 40 sq. km. in extent. These abut on the slopes just as a fluvio-glacial gravel-cone in glaciated country abuts on the end moraine. The gravel increases in coarseness, and its upper surface in slope, in an upstream direction. It is not of glacial origin, there being no glaciation in the district, and merely represents the distribution of the weathered debris by stream action. The much smaller post-glacial valley is sunk into it. It was probably formed in great part during the Ice Age, the post-glacial regime of the streams being quite different.

The reviewer has considerable experience of similar gravel spreads on the younger drift of the British Isles, where they are clearly late glacial and are merely the product of streams overloaded as a result of being out of gradient in their upper reaches. They thus cut rapidly in their upper courses and deposited freely in their lower, where they wandered widely over their gravel fans. The solifluction of a glacial period may lead to similar overloading, and it is questionable if the author's deduction of an increased seasonal flow of the streams is justifiable on the ground of these gravel spreads alone.

In the Erzgebirge, on slopes of 2° to 6°, boulder-spreads from 2–10 m. in thickness were observed, carried to distances of 2 km. by purely surface creep.

The fossil character of these boulder-spreads is provable on slopes of inclination up to 12° but not above. The present motion of the soil is very slight. The surface transport of the debris was arrested early in post-glacial time by the restored forest cover. Most of the stream-cutting on the upper slopes was effected in the vegetation-free period before the growth of the trees. This denudation, the reviewer suggests in the light of his own experience, was responsible for at least a portion of the gravel spreads to which reference has been made above.

The actual studies of the fossil solifluction of the Erzgebirge and Riesengebirge are followed by a consideration of the conditions under which such phenomena are produced at the present day. The comparison would have been more convincing if modern examples were also figured. The lower limit of boulder-spreads and soil-creep ranges from sea-level in Spitsbergen to about 1000 m. in Lapland, 1500 m. in the Riesengebirge, and 2000 m. in the Alps, being lower in Atlantic climates. It lies about 100 m. below the gnarled tree (*Krummholz*) limit, and is never very far above the boundary of high-stemmed trees. The action is essentially climatic and very little influenced by vegetation.

The paper is a valuable effort to define our ideas, but it would surely have been possible to have conveyed the information in half the space. Former work is widely discussed, but no reference is made to recent papers by Bigot, Breuil, and Koslowski. No claim is made that the effects of any ice age but the last can be recognized. W. B. W.

INSOLATION AND RELIEF: their bearing on the human geography of Alpine regions. By ALICE GARNETT. (The Institute of British Geographers. Publication No. 5 [in front of which is bound No. 4, entitled 'Transactions' and consisting of pages v–ix].) *London: George Philip & Son*, 1937. 10×7 *inches;* xiii–xvi+71 *pages; maps and diagrams.* 12*s* 6*d*

This is the fifth publication of the Institute of British Geographers, and both Miss Garnett and the Institute may be congratulated upon it. The monograph has obviously meant a vast amount of detailed and laborious work, both cartographical and climatic, but the labour involved has resulted in some very useful new and precise information.

Insolation is clearly enough a factor of great importance in mountain climates, but only too often has one to be content with generalizations. Miss Garnett has adopted a method applicable to any high area, but her own work has taken place in the Val d'Anniviers, the Innsbruck region, and the Defereggenthal. Each of these regions has some peculiar characteristics. The first is well known as an example of inverse transhumance, and the high altitude at which cultivation occurs. In the Stubaithal (Innsbruck), the orientation is intermediate (*i.e.* south-west to north-east): it lies in an area of historical interest and demonstrates the balance of various geographical factors. The Defereggenthal (Gross Glockner) is remote and little known, and, as it is not yet regularly reached by tourists, original conditions remain.

Adret and *Ubac* now come to have a meaning which can be measured and not left as a rough approximation. The author points out the importance of two factors in mountain climate: the significance of light and shadow, and sun *versus* shade temperature; and the high intensity of solar radiation at high altitudes and the contrast between ground and air temperatures which this gives.

To describe fully all that the author has done would be impossible in a review. As an example it will give an idea of the scope of the problems to note that maps of the Val d'Anniviers showing shadow areas are given for the following times:—

(*a*) Midwinter Solstice: hourly from 9 a.m. to 4 p.m. (*b*) The Equinoxes: 7 a.m., 8 a.m., 9 a.m., 10 a.m. to 2 p.m., 3 p.m., 4 p.m., 5 p.m. (*c*) Duration of sunlight throughout the day, for the Midwinter Solstice and the Equinoxes. (*d*) Percentages of the maximum possible intensity of insolation at noon at the Equinoxes. The other areas are treated even more fully. The positions of the settlements in the several valleys are analysed and some interesting features are found: *e.g.* the inversion of transhumance in the Val d'Anniviers is the outcome of the short-time period and low intensity of the lower end of the valley as compared with the long duration and high intensity at the higher altitudes.

The material is well set out, but the paper must be read with care: it cannot be assimilated at once. The great amount of detail is not always easy to follow, but it is necessary to appreciate it in order to arrive at the general conclusions. The whole is an instructive and careful piece of work of real value to the geographer and also to the agriculturist and ecologist. J. A. S.

DIE DEUTSCHEN KOLONIEN IN SÜDSPANIEN: Beiträge zur Kulturgeographie der untergegangenen Deutschtumsinseln in der Sierra Morena und in Niederandalusien. By GEORG NIEMEIER. (Ibero-Amerikanische Studien. Edited by HARRI MEIER. 10.) *Hamburg: Conrad Behre (for "Ibero-Amerikanisches Institut")*, 1937. 9×6 *inches; 126 pages; illustrations and maps. M.5*

Charles III's colonization of certain districts in the Sierra Morena is commonly written off as a failure: an opinion largely based on a purely historical examination of the question.

In 1767 the Bavarian adventurer Thürriegel entered into an agreement with the Spanish Government to procure six thousand German and Flemish catholic settlers to found a colony in the Sierra Morena, with the double object of cultivating land that had long lain waste (as a result of the Reconquest and the emigration to the Americas) and protecting at one of its most desolate parts the important highway which ran from Madrid to Seville and Cadiz. The distress in south Germany and Switzerland enabled Thürriegel easily to collect some eight thousand people, who were settled round the Puerto de Despeñaperros and on the southern slopes of the Sierra. Despite many initial difficulties the colonies took root; contemporary accounts bear witness to the improvements their industry effected; and until 1835 their system of small holdings was protected by a special regime which prevented division or alienation of land. A casual visitor to-day will however no longer find the houses painted in German fashion. German is no longer spoken. German physical types, German surnames, and a few traditions—such as the colouring of egg shells at Easter, which to a Spaniard seems unreasonable, since the eggs are to be eaten—alone seem to indicate the origins of the colony.

On closer examination however the mere fact that the settlements have survived at all, in view of the opposition from the landowners and from the Church, indicates how successful the scheme was. Some of the proposed agricultural reforms—annual crops or the cultivation of the mulberry—came to nothing; the development of the mining interests has resulted in the encroachment of large estates in the less fertile areas. But the social structure based on a system of small holdings, has remained largely unchanged, and the regular planning of the villages and the houses has been preserved, and to some extent imitated near by. That the colonists became rapidly hispanicized is not surprising: special measures were taken to bring that about, and the attractions of the colonies drew Spaniards to them. In short, if this is in one sense a clear case of "untergegangenes Deutschtum," Herr Niemeier can with justice claim that the

colonists were "Kulturdünger auf fremdem Boden." His painstaking, personal investigation of the geographical factors, of the structure of the settlements, and of methods of cultivation completes the studies by Alcázar Molina and others of the historical aspects of the matter, and enables a clear picture of the whole undertaking to be obtained. One can regret only that he was not able to provide more adequate maps. J. P. H. M.

THE GOTHS IN THE CRIMEA. By ALEXANDER ALEXANDROVICH VASILIEV. *Cambridge, Massachusetts: The Mediaeval Academy of America* (*Monographs No.* 11), 1936. 10×6½ *inches;* x+292 *pages; map.* $4.00

The author of this minutely learned monograph expressly disclaims any idea of writing a history of the Goths, on the ground that the sources are too scattered and fragmentary to render this possible. He has however collected a vast mass of miscellaneous material relating to that interesting but little-known remnant of the Gothic race which settled in the Crimea, was gradually cut off from the main stock, and was "first hellenized and later tartarized." First Christianized in the third century, they remained Orthodox, while their kinsmen on the Danube, and with them their famous apostle Ulfila, accepted the Arian heresy. Professor Vasiliev's early chapters trace their fate from the fall of the Bosporan Kingdom in the second half of the fourth century, through a succession of Hunnic invasions such as led Justinian to erect a chain of defensive forts from the Bosporus to the Chersonese. He deals in almost microscopic detail with such curiosities of history as the legend of the Doe that guided the passage of the Huns across Lake Maeotis, the earthquake inscription of the Emperor Zeno, and the identification of the site of Dory and Theodoro. Further sections deal with the beginnings of Khazar rule, the exile of Pope Martin I to Crimea, the coming of the fugitive Emperor Justinian II, followed a little later by monks flying from their Iconoclastic persecutors. There is an elaborate analysis of the metropolitans of Gothia and their relations with Byzantium. Then follow the Russian invasions (for a brief period from 962 to 972 Crimea passed under a sort of Russian protectorate) and the passing predominance of the Polovtzians or Cumans. With the establishment of the Latin Empire "Gothia" became very largely dependent on the Empire of Trebizond. The recovery of Byzantium by Michael Paleologus was immediately followed by his treaties, first with the Genoese and then the Venetians, whom he found it useful to play off against each other. Perhaps the most interesting portion of the book deals with the foundation of Caffa in 1266 by the Genoese and its fortunes during two centuries, till it fell before the Turks in 1475. Thirty years before its downfall a Spanish traveller describes it as twice the size of Seville, and of very mixed population.

The book is a marvel of minute research, but will appeal to the student rather than to the general reader. R. W. S.-W.

ASIA

BY ORDER OF THE SHAH. By H. W. and SIDNEY HAY. *London: Cassell and Co.*, 1937. 9×5½ *inches;* xiv+340 *pages; illustrations and map.* 15*s*

This book is entertaining journalism for the general reader, rather than scientific record for the serious student. It is the result of eight short visits to Iran, by authors who knew no Iranian, but who nevertheless managed to catch something of the spirit of the land. The authors owe much to the company of a philosophical Iranian gentleman, Rumi (His Highness Rumi-i-Paska, to whom the book is dedicated), whose anecdotes and tales from folklore, told in flowery language, are a feature of Part I of the book. Part I is a racy account of journeys from

Khaniqin to the Caspian *via* Kazvin, from the Caspian to Isfahan *via* Tehran, from Abadan to Masjid-i-Sulaiman, and from Bushire to Shiraz. It is marred by minor geographical inaccuracies which could have been avoided by the study of published maps. Part II is a collection of some of the better-known episodes of Iranian history, together with chapters on certain features of life in modern Iran. The most useful and interesting sections deal with Reza Shah and the important work he is doing for the country.

There follows a 5-page appendix on "Ways and means" for the inexperienced traveller, a chronological table, and a short bibliography.

The 61 illustrations at the end of the book are good, but would have been of more value had they been inserted in their appropriate places in the text.

There is an index, and a rather inadequate small-scale map inside both covers. These maps once again repeat the fiction of a road from Chahar Bah to Bampur, whereas in actuality there is a mere camel track quite impossible for wheeled traffic. N. L. F.

THE RÉGIME OF THE RIVERS EUPHRATES AND TIGRIS. A general hydraulic survey of their basins, including the river Karun, having particular reference to their lower reaches within 'Iraq. . . . By M. G. Ionides. *London: E. and F. N. Spon*, 1937. 10×7 *inches;* viii+278 *pages; maps and diagrams.* 32*s*

This volume is intended primarily for the engineer, and the numerous tables and graphs that it contains will appeal more to him than to other readers. It would also require particular training in that subject to appraise the tables at their full value. A full appreciation of the work would imply a knowledge of the Euphrates and Tigris that few can possess. The book however is one that should be read by the geographer: there is a great wealth of material in it that he requires. The amount of exact knowledge of many of the great river systems of the world that appears in ordinary text-books is small, and in the present volume the geographer will find much that bears directly on his own problems. The river basins of the Euphrates and Tigris are fully described; there is an interesting chapter on the climate of the area; and the relation between river régime and agricultural activities is dealt with carefully. The problems of irrigation, quite apart from their purely engineering interest, are well set out, and the human point of view is stressed.

The writer has been to considerable trouble to read and digest historical literature on the area. The past changes of the rivers, the intricate canal system of the ancients and their methods of irrigation, are all discussed. The two rivers make an interesting contrast: the general sluggishness of the Euphrates compared with the rather flashy behaviour of the Tigris. The difficulty of dealing with flood-waters again differs very much: there is nothing in the Tigris to compare with the Habbaniyah lake on the Euphrates. Excessive irrigation also brings its dangers as it may lead to great salinity in the soil.

The records available for the full study of the régimes of these two rivers extend over but a short time—mostly since the war. A great difficulty is that their basins extend over four countries—Turkey, Syria, Iran, and 'Iraq. The problems dealt with concern 'Iraq, but it is obvious that a full study of the river conditions in that country depends to some extent on the headwaters in other territory. Hence the desirability of obtaining greater international co-operation. The Tigris again has far more tributary streams, and flood warnings have to be shorter on that river. For the most part inundations have to be checked by embankments, and serious floods to Hit and Baghdad alleviated occasionally by escapes through breaches in the banks. The financial side of

the problem is here apparent. A description is also given of the Kalgun and Kharkeh rivers.

The author intends his book as a preliminary survey for use in the future as well as for a compendium for the present. The value of establishing river gauges and discharge stations at properly chosen points, and of having a regular and trustworthy series of readings made is stressed. In the area dealt with another difficulty arises: at remote stations it is not always possible to be sure that the readings have been correctly taken. A native having to go some miles to a station may often find his convenience better suited if he guesses the reading from the conditions in the river nearer to his home.

The author has rendered a good service in writing this book. In his preface he realizes the imperfection of records on which it is largely built and asks for corrections. The geographer will find it distinctly useful, and although its price is beyond the reach of most, it should certainly be seriously considered for departmental and other libraries. J. A. S.

DICTIONARY OF PĀLI PROPER NAMES. By G. P. MALALASEKERA. (Indian Texts Series.) *London: John Murray, for the Government of India*, 1937. Vol. I [of two volumes] A–Dh. 9×6 *inches;* xviii+1164 *pages;* 31*s* 6*d*

An index to the proper names occurring in the Buddhist Pāli literature has long been wanted by those working in many Indian subjects, and the present volume, with a second one about to follow, is designed to meet their need. Drawn up on the lines of the well-known 'Vedic Index,' it summarizes the information about each person or place which is to be gained from the texts, though all the occurrences of any given name are not specified, if at all numerous. If the longer entries might have been better arranged and would have been made clearer by suitable compression, the work from this standpoint has been well done. Detailed check of a selected part showed occasional omissions, all of a trivial nature, and a name or two given in a form of doubtful correctness, but in the main the dictionary is complete and accurate in the information it gives of the contents of the Pāli books.

But, though adequate as a storehouse of facts for exploitation by others, the book can hardly be considered authoritative. The literature it deals with is part of the Indian heritage and should be handled therefore in the light of its relation to the other sources of information about ancient India. It is only too apparent that the author has but a mediocre knowledge of Sanskrit literature, whether Buddhist or Hindu, and still less of modern research affecting his subject, defects which are particularly obvious in his handling of the geographical matter. This point may be illustrated by one or two instances from the earlier works, which have much information of value for the geography of Northern India. Thus the entry under the interesting name 'Koṭumbara' proves that Przyluski's admirable paper on this people has never been consulted. Again under 'Dvāravatī' objection is taken to the *Petavatthu's* statement that it was a city of Kamboja; but the Sanskrit sources contain clear indications, too often neglected it is true, that the Kambojas had penetrated to the sea-coast of this neighbourhood in the early centuries of the Christian era. Under 'Ceti' the author follows Rhys Davids even to the misspelling of their Sanskrit name and there is no justification for the suggestion that they ever had a settlement in the mountains, "probably the present Nepal." The 'Vedic Index,' not lightly to be neglected, prefers Bundelkhand, and Rhys Davids's guess was based purely on the *Vessantarajātaka*, which hopelessly confuses the topography. A comparison of the various versions shows that the Pāli one still preserves valuable traces of the original story, which placed the tale in and around the

real Cedi country in central India, and probably the locale was altered for the benefit of the pilgrimage place in North-Western India which later ages identified with the site of Vessantara's hermitage. Besides the entries relating to Northern India, the dictionary records from the later works numerous places in the Southern kingdoms of India and in Ceylon, hardly any of which are identified; such a familiar name as Toṇḍamāna, for instance, suggests nothing to the author.

Altogether, glad as scholars will be to have this index to consult, most of them will regret that the author did not see fit to defer publication till he had had time to master all the relevant material. E. H. J.

THE SUNWHEEL: Hindu life and customs. By HELEN CAMERON GORDON (LADY RUSSELL). *London: P. S. King & Son*, 1935. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* viii + 220 *pages; illustrations and sketch-map.* 12*s* 6*d*

This is an attractively written account of visits to places in South India noted for their religious, historical, or cultural associations. Interesting descriptions are given of Hindu temples at Chingleput, Conjeeveram, Tanjore, Trichinopoly, Madura, and Ramesvaram, of Bangalore and Mysore City, and of sites in the Cochin and Travancore States as far south as Cape Comorin. The authoress did not travel like the usual cold-weather tourist, but with a deeper insight into the religious thought and customs of the people around her; and personal discomfort did not deter her from pursuing her quests. Temple ceremonies, state functions, popular festivals and dances, incidents in the social life of all classes, down to the aboriginal tribes still surviving in some of the hill tracts, are graphically described, with occasional shrewd comments on the practices observed and the ideals professed. Well-merited praise is accorded for the efficiency and enlightenment with which the Mysore State has been administered under its present ruler.

The general reader interested in things Indian will peruse this little book with pleasure and perhaps profit, but the scholar will notice several verbal and other errors. For example, on the coloured frontispiece the name Arjuna (the great Pandava warrior) is a mistake for Aruna, the (rosy) dawn, personified as the charioteer of the sun. *Koubba* is apparently a mistake for *qabr*, "tomb"; *kharma* should read *karma*, and *vythian*, *vaidyan; math* does not mean a dispensary, but a monastery; and so on. C. E. A. W. O.

THE ASCENT OF NANDA DEVI. By H. W. TILMAN. *Cambridge: University Press*, 1937. $9 \times 5\frac{1}{2}$ *inches;* xii + 236 *pages; illustrations and maps.* 12*s* 6*d*

Nanda Devi, the highest mountain in British India, is 25,645 feet high. Its shapeliness has delighted many climbers and travellers, but for years it proved impossible to reach the foot of it, as it rises from a basin surrounded by peaks almost as great in height. This ring is breached at only one point by the Rishi river which however flows through a gorge so narrow and difficult that two early parties failed to penetrate it. In 1934 Eric Shipton and the author of the present book succeeded in breaking a way through the outer defences of Nanda Devi. Their route followed the gorge, but it had to be an up-and-down zig-zag over the steep and smooth rock walls where indifferently attached vegetation often provided the only available foot and hand hold. The inner basin which they reached had presumably never before been trodden by man and the herds of wild animals approached them without fear.

The expedition which Tilman now describes was initiated in America and eventually consisted of four American and four English climbers. As Dr. Longstaff says in the Introduction, "the book is the story of a self-sufficing party of friends who provided their own finance and eschewed publicity." In

the early stages there was no official leader, though on Tilman fell much of the work of handling the porters: he has a great gift for understanding them and was also the only man who knew the details of the route. When the time came for the final attack on the summit he was voted into the lead to direct the activities of the team. It is appropriate therefore that he should be the one to give an account of the achievement.

Over half the book is devoted to the story of the approach through the Rishi Gorge, but no one will regret this for it holds the reader quite as enthralled as the account of the high climbing itself. The difficulties of the gorge were increased by bad weather and the refusal of the Dotial porters from the Himalayan foothills to continue through country so unfamiliar to them. From the point where the Dotials turned back the Europeans carried loads equally with the remaining Sherpa and Mana porters, an effort generally not asked from high climbers. At the foot of the peak the Mana men returned and the second phase of the expedition with its more orthodox mountaineering problems began. Surprisingly enough none of the Europeans seem to have felt very seriously the effects of altitude, and the party carried out the heavy work at all heights which their tactics necessitated. The climb was made in the middle of the monsoon, but the snow remained in tolerable condition and only once, near the summit, were they threatened by avalanche. Just in time, before shortage of food and change of weather forced a return, their magnificent efforts were rewarded by two of their number reaching the summit, the highest peak which has yet been climbed.

All the effort of the party was concentrated in the one endeavour of climbing the peak, and Tilman in describing the expedition likewise does not let himself digress. By the end of the first or second chapters the reader must accept the style in which the book is written and he will then enjoy the directness and humour of it. Dr. Longstaff in the introduction asserts that in the opinion of competent judges the climbing of Nanda Devi is the finest mountain ascent yet made; Tilman has written a thoroughly fitting account of such an expedition.

It is a great pity that the illustrations, which should form a valuable part of the book, are poor. For the most part they seem to have been badly reproduced.

L. R. W.

PLANT HUNTER'S PARADISE. By F. KINGDON WARD. *London: Jonathan Cape*, 1937. 8 × 5½ *inches;* 348 *pages; illustrations and map.* 12*s* 6*d*

"There is probably no other country like northern Burma in the world. There is jungle as thick; there are mountains as high and steep; there are climates as humid and extreme. But the combination of all three is unique." It would be hard to make an account of thirteen months in this kind of country uninteresting, at least to some section of the public, but Captain Kingdon Ward has succeeded in the almost impossible task of producing a book which is as enthralling to the general reader as to the expert. The longer one travels in any one part of the world, the more difficult it must be to satisfy the curiosity of those who have never been there. So many things come to be taken as a matter of course by veteran travellers that their accounts tend to become more and more specialized and less and less readable. Captain Kingdon Ward has escaped from this snare, and without sacrificing anything.

At the end of November 1930, he and Lord Cranbrook left the railhead in Upper Burma and travelled northwards to the Tibetan frontier in an effort finally to determine the source of the eastern branch of the Irrawaddy. They spent nine months in one of the two valleys which have been partially colonized

by Tibetan immigrants, to the ultimate, though unintentional, extinction of the far more primitive Darus; and were able, after a great deal of trouble, to cross over into Tibet in September 1931 and to continue their search for the source. When almost within reach of their objective they were turned back by the passive hostility of the natives, who refused to provide transport. They had gone far enough however so to limit the possibilities that the true position of the source is now "a matter of academic interest only."

Flowers are naturally Captain Kingdon Ward's main interest, but he is a keen observer of everything, with an eye for those apparently unimportant details which make a picture live in print. His descriptions are as good as the twelve photographs which illustrate this book. The thirteenth, the frontispiece, has probably been included in error, for it has no bearing on this journey, and was taken on the author's 1935 expedition into southern Tibet.

An excellent book is completed by two clear sketch-maps and four appendices, the second and third of which should be of considerable value to future collectors in the Taron and Nam Tamai areas of Upper Burma. It is perhaps a pity that dates are not more frequently mentioned. R. K.

AFRICA

LORDS OF THE EQUATOR: an African journey. By PATRICK BALFOUR. *London: Hutchinson & Co.*, 1937. 8×5½ *inches;* 336 *pages; illustrations and map.* 12*s* 6*d*

Mr. Balfour has written a valuable book for the general reader who wishes to grasp the main outlines of the present position in tropical Africa. Designed as a book of travel, written in a lively style, and interspersed with amusing anecdotes, it is likely to be more successful in achieving its object than a formal exposition of the problems of colonial administration, mandates, and native psychology. The author travelled by air to Bangui in French Equatorial Africa, thence to Mpouia in Belgian Congo, and on by road and rail to Loanda; returned by steamer to Duala and motored through the French Cameroons territory. This was the more important section of his itinerary. His subsequent journey through Tanganyika and Kenya is described in less detail, and his account displays less sympathy with these administrations. He received much hospitality, though not exclusively, from officials in French and Belgian territory, to whom he owed a good deal of his information. As he is careful to indicate the sources upon which he has drawn, his record has more than a passing value. He is an enthusiastic admirer of the type of administrator now being trained by the "École coloniale," and of the manner in which past mistakes are being remedied in French Equatorial Africa. Among other topics which he treats with equal impartiality are the position of the German settlers in the mandated territories, the African and western education, the merits of indirect administration, and the effect of the impact of modern economics upon native society. If much of this has already been said elsewhere, Mr. Balfour succeeds in stating it freshly and emphasizing his points from his own recent experiences. He is at pains to emphasize the comparative shortness of the contact between white man and negro, and the necessity for proceeding slowly with the introduction of European ideas and standards. G. R. C.

MOUNTAINS OF THE MOON: an expedition to the equatorial mountains of Africa. By PATRICK M. SYNGE. *London: Lindsay Drummond*, 1937. 9×5½ *inches;* xxiv+222 *pages; illustrations and maps.* 15*s*

This is an account of an expedition to the mountains of Central Africa, Elgon, Aberdare, Mfumbiro, Ruwenzori, and Kenya, organized by the British Museum

to study the flora and fauna of the equatorial mountains in relation to their environment. The author is a botanist, and the interest of the book is mainly botanical.

The author mentions the curious fact that many of the genera on these mountains, and even a few of the actual species, are similar to those found in England; and that the same affinities were observed among the insects. He also comments on the fact that on each mountain there is the same general aspect and zonation of the flora, and the same peculiar feature of "gigantism" in certain genera; and (in the Introduction) he discusses the reasons for these phenomena.

About one-third of the book consists of the account of the visit to Ruwenzori which was the main object of the expedition, and on which is based the title. On this mountain the expedition was divided into two parts, which respectively explored the valleys of the Nyamgasani and the Namwamba, hitherto almost unknown. The physical difficulties were great: the elevation, the steep slopes, the dense vegetation and absence of paths. On the other hand, on a mountain noted for its excessive rainfall they had hardly any; a happy state of things which may or may not have been attributable to the presence of a "rain man" with a magic whistle, which he blew to keep off the rain clouds. Ruwenzori exercised on the author a great fascination, and it is, he says, the only one of the mountains visited to which he is really anxious to return. His descriptions of its fantastic scenery are very vivid.

Elgon is described as "an easy and comfortable mountain to climb . . . a holiday excursion." In the region of the Mfumbiro volcanoes the author was greatly struck with the beauty of the landscape, an opinion with which those who have visited that country will cordially agree. The three eastern mountains (Muhavura, Mgahinga, and Sabinio) were climbed, the rugged Sabinio not without some difficulty. On the expedition to Kenya the author was accompanied by four Baganda students from Makerere College, and he has much to say of their intelligence and charm.

To those not primarily interested in botany the last four chapters will perhaps have the greater appeal. In these the author gives a fair description of Uganda as it is to-day—mainly a picture of Kampala, the principal town; a short account of the past history of the country; and discusses local education and the progress made by the Baganda. He makes some pertinent queries and criticisms, but his attitude is mainly sympathetic. He disagrees with those who hold that the capabilities of dark-skinned peoples are naturally much below those of Europeans, and considers that such a theory is disproved by the results obtained by Africans in examinations with a European standard. But one may be permitted to ask whether the very rapid assimilation by the Baganda of a degree of knowledge which it has taken white people many generations to acquire is not liable to produce some mental indigestion and other evils.

There are two Appendices. The first contains a convenient summary of the early legends relating to the sources of the Nile and the Mountains of the Moon. Nothing conclusive can be derived from these, but the general feeling among those interested in the subject is that Ruwenzori is the most probable origin of the legends. The other Appendix deals with the cultivation of African plants in English gardens.

There are two maps, which are not quite so helpful as they might be, and an index. The book is profusely illustrated with excellent photographs, and with reproductions of imaginative drawings and paintings by Stuart Somerville.

E. M. J.

EAST AFRICAN PLATEAUS AND RIFT VALLEYS. By BAILEY WILLIS. (Carnegie Institution of Washington. Publication No. 470. Studies in comparative seismology.) *Washington*, 1936. 11½×9 *inches;* x+358 *pages; illustrations and maps*

This book is remarkable for the mass of geographical detail it contains, so much so that now and again this tends to mask the essential facts, which would have been easier to digest had each chapter been summarized or a series of conclusions given at the end of the volume. On the whole the author supports the compression theory of the formation of Rift Valleys: he remarks that "horizontal tension" is unacceptable "as a basic condition," and forms a hypothesis upon which the structure of Africa around Lake Victoria is based. This depends on the supposed existence of an asthenolith, which it is suggested originated in Archaean time, underlying the lake at a depth of the order of 25 miles. Its upper limits are assumed to be marked by the Rift Valleys of to-day. Owing to the accumulation of heat and consequent rock-melting and differentiation provided by the recurrent action of radio-activity, the cover of the asthenolith suffered "metamorphic expansion in a horizontal sense," producing those examples of compression which the author has observed round the margins of the East African Plateau, the most noteworthy being the uplifted mass of Ruwenzori. In brief, "an expanding disc under the Lake Victoria saucer" is claimed as the cause of the structures observed.

The applicability of such a theory depends on proof that compression was the dominant force in the production of the chain of fractures which extends from Palestine to Portuguese East Africa and from the Luangwa Valley to the Indian Ocean. In the opinion of the present writer these must be judged as a whole, and though the results of compression are to be observed here and there, he believes that tension has been the prevalent tectonic force. Although the answer to the riddle of the Rifts may lie around the lake, the present-day structure was, at least partially, initiated at a very early geological period. The author emphasizes, as have others, the importance of uplift in respect of the characteristic plateaus and points out that Africa differs "in some fundamental way" from the other continents by the elevation of "large portions of its great mass." He finds the cause in the indirect action of the asthenolith aided by the presumed expansion already mentioned. The Rift Valleys are considered to have developed as an effect of the differential vertical stresses thus engendered, the "doming in Kenya Territory" is inferred to be due to the "continued internal pressure of rising lavas," again as a result of the expansion which is the mainstay of Professor Willis's theory. The book is thus largely theoretical and the hypothesis put forward one which it is difficult to criticize owing to the uncertainty of the factors which it involves. "Non-proven" will probably be the general verdict. The statement that Kilimanjaro stands on an east and west volcanic zone is in the present writer's view rather misleading. Kilimanjaro stands on a line of weakness running northwards through the volcanoes of Mount Kenya, Marsabit, and Huri, nearly parallel to the eastern rift. The east and west fracture through Mount Meru is very subordinate. The author travelled extensively and describes what he saw with great precision and minute care. His conclusion that "the crater-form basin" of Ngorongoro is "a section of the Rift valley" may not meet with general agreement, but there can be no doubt that the book is a mine of geographical information, magnificently illustrated and supplied with informative block diagrams and maps.

The volume concludes with chapters on earthquake conditions and gravity tests. Some misprints occur, but the book, though necessarily bulky, is admirably produced. J. P.

MOISTURE AND FARMING IN SOUTH AFRICA. By W. R. THOMPSON. (South African Agricultural Series, Vol. 14.) [*Johannesburg*] *South Africa: Central News Agency* [*London Agents: Gordon and Gotch*], 1936. 9 × 5½ *inches; 260 pages; illustrations and maps.* 21*s* (*postage* 6*d extra*)

To peoples owing so much to the traditions of farming in Western Europe, the sub-humid to arid lands of the Union have presented many problems. Among these none have been more urgent than those having their roots in the fickleness and violence of the rainfall. Not unnaturally the public have adopted an attitude of pessimism believing in a progressive deterioration of the climate and at the same time showing a readiness to blame various causes without critical inquiry.

The larger part of this work examines the problem of drought and its causation in the light of written records for the earlier, and of rainfall data, for the later years. Written testimony tends to show that drought is nothing new in South Africa, while a careful analysis of rainfall since *c.* 1880—using moving averages and residual mass curves—justifies the main conclusion that though "over the last 40–50 years the annual rainfall in certain parts of South Africa shows a more or less definite though irregular downward trend until 1933," there is "no proof of any permanent diminution." Nor do the data support the prevalent belief that the rainfall is becoming more violent in its nature. In short, a good case is made for the view that here, as elsewhere in countries of barely sufficient rainfall, misuse of the land by overstocking and grazing, unrestricted burning, and, in some cases, a mal-adjusted agriculture, have created a position for which here, as elsewhere, nature has been blamed.

Disproof of popular theories on the causation of drought conditions is less rigorous, but such ideas as the adverse influence of exotic trees, and the effectiveness of a rise of the land, are treated critically and dispassionately; and in a similar way the evidence is marshalled to condemn the hare-brained, so-called Schwarz scheme for the reclamation of the Kalahari.

This rational treatment of the drought problem is an important contribution, as it must serve to clarify local opinion; but for many the real interest of the book will lie in the results of Mr. Thompson's experiments upon water economy in plots under typical South African farming practices. Transpiration, evaporation, run-off, leaching, and soil erosion have been measured, and if, as he stresses, some measurements must be treated with reserve, no doubt remains on such major issues as the dominance of transpiration and evaporation in the dissipation of moisture in maize cultivation; the high degree of run-off and the serious soil loss from moderately sloping bare cultivated ground; and the significantly greater soil loss from burned than from unburned veldt. In a country where "in many respects agricultural practices are based on principles established abroad"—in moister lands—this quantitative study of water economy is of first-rate importance. It is to be hoped that it, and continued work in the vigorous department of Pretoria University from which it comes, will do much to give the South African farmer a background to his problems based on principles established in his own environment.

It is regrettable that such important work should be so unattractively set forth. The chapters seem to be designed as self-contained essays, repetition is rife, and the consequent tedium is not relieved by the frequent "chapter summaries." H. A. M.

SOUTH AFRICAN CINDERELLA: a trek through ex-German South-west Africa. By REX HARDINGE. *London: Herbert Jenkins*, 1937. 8½ × 5½ *inches; 348 pages; illustrations and sketch-maps.* 15*s*

Mr. Hardinge has an affection for the remote places of Africa, and no discomfort or danger does more than stimulate him to further endeavour. His

Cinderella is the desert and arid grasslands of South-West Africa, formerly held by Germany and now virtually a fifth province of the Union of South Africa. Although, as he says, it has been described as a land fit only for Bushmen and goats, the author succeeds in writing a narrative as colourful as it is veracious. Setting out very light-heartedly from Cape Town on an overloaded and already much-worn bicycle, he traversed both the dry Western Cape Province and the even drier "South-West" from south to north. His conveyance was not always the best possible for his purpose, but in the main it served his need triumphantly. The narrative is lessened in value by the absence of a satisfactory map, and the frontispiece sketch of the route is altogether too fragmentary to be of much assistance to those English readers who do not know South Africa. Mr. Hardinge however almost renders a map superfluous by the employment of a most graphic style. One of the principal motives of the trek was to study the conditions of life of the various impoverished communities which make up the society of "South-West", such as the Bushmen, Hottentots, Rehoboth Bastards, and Hereros, and to discover the attitude of these native groups to the possibility of a return of the territory to German sovereignty. Mr. Hardinge is particularly severe on the Germans, but he would do well not to forget the condition of the Bantu in those parts of Africa where German influence has never penetrated. W. F.

MAGNETIC DECLINATION IN SOUTH AFRICA (1936), published in connection with the Isogonic Magnetic Map of South Africa, south of latitude 18° S. for the approximate epoch April 1936. By A. D. Lewis. *Pretoria: Government Printer*, 1937. $9\frac{1}{2} \times 6$ *inches; 20 pages; charts and map. 2s 6d*

This small pamphlet, including nineteen pages of text, explains the two charts which accompany it. The main chart gives lines of equal magnetic declination (or isogonic lines) over most of South Africa south of latitude 18° S. The scale is 79 miles to the inch, so that a square degree measures roughly $\frac{7}{8} \times \frac{3}{4}$ inch: Boune's projection is used. The isogonic lines are drawn at 1° intervals, and range from 10° W. in the north-east, near Beira and Salisbury, to 24° W., near Capetown. The chart is the first magnetic map of this region to be published under Government authority, and is based mainly on official data.

Such a map was badly needed, as the secular variation had rendered the pioneer maps due to Beattie out of date. Beattie's work was done during the years 1900–15, after which little magnetic observation was undertaken until Grindley reoccupied a number of selected stations, under the auspices of the Carnegie Institution of Washington and the University of Capetown. The secular variation over South Africa is not at all uniform, and its changes with time appear to be considerable and are not at all properly known. The present isogonic chart includes a small supplementary isoporic chart (*i.e.* a chart showing lines of equal annual change of declination), but the other chart which accompanies the pamphlet, and contains five tentative isoporic charts for different epochs between 1913 and 1937, emphasizes the present uncertainty of our knowledge of the secular variation in South Africa.

Almost the whole region covered by the isogonic maps is subject to local magnetic abnormalities, and the isogonic lines represent a considerable smoothing out of the irregularities, as is both desirable and necessary. A huge area near the centre of the map is specially disturbed, declinations ranging from zero to 30° W. being found within distances of a few hundred yards in some parts of this region; this is due, according to Du Toit, to an underlying iron-ore deposit, one of the greatest in the world. In view of these abnormalities of the

field there is justice in the claim, made in the pamphlet, that in preparing such a map a large number of readings taken rapidly with reasonable accuracy is preferable to a small number of refined observations taken slowly.

The present map is based on about 2150 observations (after rejecting about 150 doubtful ones), and within the Union these were at the rate of about 17 per square degree; they were made over a period of only $2\frac{3}{4}$ years, by 12 parties whose main work was a topographical survey. All the observations over each square degree were averaged, and the isogonic lines were drawn smoothly between these averaged values. The observations were not corrected for transient or secular magnetic change.

The magnetic survey and the construction of the map were of course undertaken with a utilitarian purpose, but they represent also a contribution to geophysical science. This contribution is naturally limited by the fact that only the declination (the direction of the horizontal component of the field) is included in the work; for a scientific study of the field it is important that the magnetic dip, and the field intensity, should also be observed; and it is probable that such knowledge would in time justify its cost by its subsequent economic value. It is therefore to be hoped that the Government of the South African Union will continue and extend the good magnetic work it has thus begun, mindful especially of the fact that owing to the secular variation, data once lost (or not obtained) cannot be recovered. S. C.

NORTH AMERICA

THE COLORADO DELTA. By GODFREY SYKES. *New York: Carnegie Institution of Washington and American Geographical Society (Special Publication No. 19), 1937. 10×6½ inches; viii+194 pages; illustrations and maps.* $4.00

The author, a research associate of the Carnegie Institution, has been studying the Colorado delta for forty-five years. The publication of what he has observed is peculiarly timely, since the flow of the river is now undergoing rapid stabilization as the result of its regulation by Boulder Dam. It will be interesting to see what a similar study will show twenty years hence.

There were three periods in the discovery of the Colorado, separated by Dark Ages when its existence was all but forgotten. The first to sail up its waters was Francisco de Ulloa, one of Cortes' captains, who in September 1539 was taken unawares by the violence of the tidal currents in the delta and awoke to find his boat stranded on the red mud shoals of the "Vermilion Sea." Within the next twelve months two other Spanish adventurers made voyages to the head of the Gulf. But the discoveries of these early explorers were so completely forgotten that within half a century the Lower Colorado had become part of the mythical "strait of Anian" which was supposed to separate the Isle of California from the mainland. In 1701 Father Kino, a pioneer among the Spanish Catholic missionaries, came overland and rediscovered the river. It was visited by Father Konscak in 1749 and then again neglected for eighty years. In 1826 Captain Henry, a British naval officer, sailed up the Gulf and duplicated de Ulloa's experience in one of the delta channels, breaking his rudder besides. Since then, many have added to our knowledge of the lower river and its vagaries, especially during the days of active navigation before 1877, when railroad competition bankrupted all water traffic.

The physiographic history which occupies the second part of the book falls naturally into four decades. Towards the end of the first period of relative stability there were signs that the river was fast reaching the limit of its silt-

carrying ability. The cycle was abruptly ended by the great diversion which poured water into the Salton Sink depression. During the third period, while the river was blindly seeking outlet to the south-west, the salinity of the Salton Sea rose progressively as the strand-line receded. In connection with this period of lake decay, the author discusses the rate of formation of travertine, the wind and wave action on soil basins, and the development of barchans. Artificial diversion became necessary to avert the increasing flood risk to the Imperial Valley and the years 1920–30 saw the making of a system of levees and canals to deflect the outflow to the south-south-west. This induced a partial stabilization to which the new engineering works of the present decade will greatly contribute.

The third section of the study deals with stream dynamics and gives valuable data regarding the river load, its constitution, fluctuation, movement, and mode of deposition. The complex process of delta building is discussed and the effects, already observable, of the ponding behind Boulder Dam are described.

The book is fully documented, the bibliography listing over 250 references.

G. B. B.

YUKON YESTERDAYS: thirty years of adventure in the Klondike. By Major NEVILL A. D. ARMSTRONG. *London: John Long*, 1936. $9\frac{1}{2} \times 6$ *inches;* 288 *pages; illustrations and maps.* 18*s*

This is a lively account of gold-seeking in the Klondike, chiefly in the early days. The initial difficulties of travel and supply, the privations suffered by the miners, and the varying fortunes of prospectors, are vividly described in an easy colloquial style. The story told in Chapter IX entitled, "The Yukon's greatest crime," where the callous murder of three successful gold-seekers was discovered through the skill and patience of detectives and police, aided by a sagacious dog, is among the most interesting passages, and shows the high qualifications required for work of this kind in those distant localities. The chapter on "old Klondike characters" describes the effects upon various individuals of isolation, uncertain prospects, and the reckless life in Dawson City during the early period of the gold rush. The last few chapters deal with the difficulties and obstacles surmounted by the author and a friend with their recently married wives in the little-known waters of the McMillan river. For sixteen months the party was cut off from the outside world and endured, among many other hardships, cold spells with the thermometer more than 50° below zero.

The illustrations and maps give a good idea of the localities visited, and help the reader to follow the experiences of the characters mentioned in the book.

W. G. G.

UNFLINCHING: a diary of tragic adventure. By EDGAR CHRISTIAN; with an introduction and conclusion by B. DEW ROBERTS (published by W. F. CHRISTIAN). *London: John Murray*, 1937. $7\frac{1}{2} \times 5$ *inches;* viii+156 *pages; illustrations and sketch-map.* 6*s*

In 1926, Mr. J. Hornby, the Canadian explorer, left Edmonton for Fort Resolution and set out for the north-eastern arm of the Great Slave Lake, with the intention of examining the country to the north and ultimately reaching the coast. He was accompanied by Mr. Harold Adlard and Edgar Christian, the latter fresh from school. Hornby was an experienced explorer, but the winter of 1926–27 was one of exceptional severity, and the party was unable to live on the country as had been planned. On 17 April 1927 Hornby died, in the cabin which they had built at the junction of the Thelon and Hanbury

rivers, 300 miles west of Chesterfield Inlet (*Geogr. J.* 72 (1928) 490). Less than three weeks later Adlard succumbed, and Christian himself died soon after June 1. The hut was finally found by an official search party, and in it the diary which is here printed, kept by Christian from the time when they left Fort Resolution down almost to the day of his death. Almost his last act had been to push it into the stove, so that it was preserved intact while the cabin leaked and rotted. The action was typical of the man, of the stoicism with which, after watching his companions die, he faced the gradual weakening from starvation that could only mean death for him too.

CENTRAL AND SOUTH AMERICA

TRANSGRESSOR IN THE TROPICS. By NEGLEY FARSON. *London: Victor Gollancz*, 1937. 9×5½ *inches;* 320 *pages.* 10*s* 6*d*

Mr. Farson can be expected to write vigorously, frankly, and well; his new book will maintain his reputation, and is the most stimulating picture of South America that has been presented for a long time.

He determined to have a look at South America last year, and reached Venezuela by way of Barbados, Trinidad, and Curaçao. The route is usual enough, and so are the things seen, but Mr. Farson's comments are unusual. La Guaira's heat haze obscured his first sight of the "sad Continent," but did not impair his genius for absorbing and summing up information. It was however in Colombia that he got into his stride. His views of Barranquilla and of Cartagena, and his vivid accounts of a local bull-fight and cock-fight, endorse and enlarge one's memories. Here and in the Canal Zone he spent his time in bars and dance halls, and, one night, in jail, meeting characters described with a pen no less pungent than when he presents accounts, later, of political interviews. Experiences in Panama delayed his re-entry into Colombia at the Pacific port of Buenaventura (consistently mis-spelled); thence he went to and appreciated Bogotá, visited estates in the Cauca valley, and later followed the new international road to Quito in Ecuador. From Ecuador Mr. Farson went to Peru, and thence to Chile. But, leaving the West Coast and making for a steamer on the Atlantic side, he determined that he "wouldn't even look" at the countries east of the Andes. He had had enough of South America. "It has left a mark on me for the rest of my life. It is like a tattoo," he declares. So far as one can tell from internal evidence, Mr. Farson cares for and knows nothing of the flora and fauna of South America, and little of great economic developments; but he does see the great land masses, population, and trend of society in a wide sense. His sight is keen and clear, and for this reason one would like to have his comment upon the economic gulf between regions west of the Andes and the broad agricultural countries of the east, where, mainly for reasons ultimately connected with geography, a different series of social problems is in process of evolution. If Mr. Farson keeps his word, he will not measure those differences, which is regrettable. The traveller who uses to the full an ability for personal contacts, who records carefully, with wit and without sentimentality, exactly what he sees, commands the blessing of his readers. It is only when Mr. Farson depends upon hearsay that fault can be found with the accuracy of his book. For instance, he repeats stories of the Jivaro Indians of Ecuador, of whom we have heard *ad nauseam*, and reproduces the old statement that nobody knows how the famous "head-shrinking" is done; whereas not only does Farabee's excellent monograph on the subject explain the process, but object lessons have been given on the subject by medical students in Quito.

L. E. J.

MY JUNGLE TRAILS; a narrative of adventures in the jungles of Central and South America, and the West Indies. By A. HYATT VERRILL. *London: George G. Harrap*, 1937. 9×6 *inches;* viii+329 *pages; illustrations.* 12*s* 6*d*

Mr. Verrill has turned out a good deal of material in the past, dealing with his various experiences in Central and South America; and he has done better work than the present volume. It suffers from lack of dating and of identification of regions; and this general want of precision extends to the illustrations, few of which possess titles giving exact localities. Reproduction of these photographs is poor, and many are apparently far from recent. The book purports to be a survey of forty-eight years' experiences. There is thus an excuse for the ground to be rapidly covered, and had the author given a summary of his travels the reader might be better pleased; but the chapters skip from place to place, and subject to subject, although with no wider range than the fringes of the Caribbean Sea.

A number of pages in the first part of the volume are devoted to condemnation of exaggerated tales written by other travellers. Mr. Verrill is probably right in saying that the perils of sickness, starvation, insect bites and accidents in the "jungle" are more to be feared than the attacks of savage Indians or of venomous reptiles. But his scorn for discoverers of "green hells" and strange Indian tribes is rather that of the pot for the kettle. Mr. Verrill cannot have it both ways. The chief descriptive passages of his book are concerned with the traversing of tangled green forest, and encounters with peculiar native folk. In the latter connection, the author's suggestion that the Indian clan-name which he spells "Bourabee" is derived from the word "buccaneer," cannot be accepted. It seems more likely that these people are Bribris, known by that name for some four centuries as natives of the Veragua region. L. E. J.

PERUVIAN PAGEANT; a journey in time. By BLAIR NILES. *London: John Murray*, 1937. 9×6 *inches;* xii+355 *pages; illustrations and sketch-map.* 16*s*

Mrs. Niles' new book is written with her accustomed facility. It is easy to read, and to all those who like travel books that offer a little observation supported by a great deal of reminiscence re-dressed from other writings, ancient and modern, this volume will appeal. Its size and appearance are alike imposing, and the illustrations are from well-taken photographs by the author's husband; some, notably of ruined fortresses in the interior of Peru, have been outdistanced by the work of Bingham, and, more recently, of Mr. Bennet Grieg; but they form handsome pages.

The author travelled by air from Miami to Lima; and from that capital visited Paracas, Pachacamac, and Cajamarca. Thence she proceeded to Arequipa and Cuzco, visiting from the latter point the ruins of Machu Picchu and Ollantaytambo. These trips were interesting, if hasty; and had Mrs. Niles given us, simply and with accurate detail, an account of what she saw, her pages could not fail to be of interest. But she interlards actual observation with "dreaming" of the past as recorded in other familiar pages. Thus, a brief visit to that magnificent site, Ollantaytambo, occupies no more than ten lines, while the pages which might have been filled with illuminating description are occupied with excerpts from other publications. The work of Cieza de León, Garcilaso de la Vega, and that genial weaver of legends, Ricardo Palma, are drawn upon as well as the publications of such foreign observers of Independence times as General Miller: all are well known. This is, perhaps, pardonable padding; but the rows of dots, exclamation marks, and innumerable sentences beginning with "And," become, with repetition, a little tiresome to the reader who

would prefer that a new book on South America should be lucid rather than ladylike.

The author might note that the Incas never wore a *llanto* ("loud weeping"): presumably Mrs. Niles meant *llauto*, the fringe, indicating rank. Also that no one ever saw "quantities of little bizcochos grunting around the underground burrows." A *bizcocho* is a biscuit; and even the little rodent *viscacha* is much too shy to let any one hear much of his grunting. L. E. J.

ESCAPE TO THE TROPICS. By DESMOND HOLDRIDGE. *London: Robert Hale & Co.*, 1937. 9×5½ *inches;* 288 (incl. viii) *pages; illustrations and sketch-map.* 12*s* 6*d*

Here is a brightly written story of a young American couple who escaped from the bondage of routine and lived for some time on one of the Virgin Islands, "part of the necklace of islands that lay scattered in a broad arc from Florida to the Spanish Main." Accompanied by a few books and cherished pictures and a minimum of personal belongings, theirs was a pleasant experience—among islands just sufficiently remote and uncivilized to attract an unconventional and not-too-wealthy couple escaping from the disastrous trade depression which swept the United States.

Possibly the last quarter of the book contains most of interest to geographers. Mr. Holdridge, who had previously collected museum specimens on the Amazon, heard those drifting rumours that Redfern, the long-lost American aviator, was still alive and living with the jungle people of Brazil. The author decided to institute a search for Redfern himself, and an unforgivable map (p. 241) gives us an impression of his journey up "Voodoo's Own Black River" from the Atlantic coast to Maripa village, where he abandoned the search. A solemn warning is given to deter inexperienced and badly financed explorers from making the attempt to rescue Redfern.

The first sections of the book, dealing with the Virgin Islands, are by far the best: the journey up-river towards Brazil has little in common with them in either related interest or quality. At the same time the whole makes pleasant light reading, and many interesting facts emerge. One is that the position of the Pleiades determines the time when the natives shall clear new fields. It is a curious coincidence that the savages of many parts of New Guinea reckon time by the same constellation. A. J. M.

DE BUENOS AIRES A MISIONES EN CANOA; relato de viaje. By ERIC PIXTON. *Buenos Aires: Editorial Claridad*, 1937. 7×5 *inches;* 203 *pages.* $1.00 (*Arg.*)

This unpretentious little volume will not only please people interested in Argentina, but those with an understanding of travel by inland waterways.

Mr. Pixton set out with his friend in March 1933, from San Isidro, on the Rio de la Plata. Their craft was a canoe of rubbered canvas, carrying a small sail as well as paddles; their chief objective, reached by way of the Upper Uruguay river, was the Territory of Misiones near the Brazilian border. They slept on sandy banks beside the water; sometimes were fêted on prosperous estancias; and for the rest got food where they could, occasionally shooting game or fishing. They met with smugglers and made friends with vagrants and "gente decente" alike; and were more than once arrested by the police as suspicious characters.

Mr. Pixton's style is pleasant, but the narrative is perhaps too much overloaded with verse and with historical reminiscences. L. E. J.

AUSTRALASIA AND PACIFIC

WONDERS OF THE GREAT BARRIER REEF. By T. C. ROUGHLEY. *Sydney, Australia: Angus and Robertson*, 1936. 9×6 *inches;* xiv+282 *pages; illustrations and sketch-maps.* 15*s*

The Australian Coral Barrier is far and away the greatest reef area in the world, and the magnificence of its coral formations was first made known by Saville Kent's great work. But it is to the present volume, illustrated with coloured plates, that the general reader should turn if he wishes to have a better idea of coral in its natural state.

This, as its title implies, is no formal treatise; on the other hand, it is not a haphazard series of chapters. No one person can ever give a true picture of the reefs, and the author writes mainly from a zoological point of view. The professional biologist may regard it rather lightly, but the ordinary reader and the expert whose subject is not biology will find it remarkably interesting and informative.

The author, whilst apparently most familiar with the Bunker and Capricorn Islands, has travelled over much of the area, and he describes the life—in the fullest sense—of the reefs in a most entertaining way. He also deals with what may be called the economics of the reefs, and gives readable accounts of the pearling, trochus shell, and beche-de-mer fisheries.

The book is a welcome addition to the general literature on coral reefs. We would only quibble with the author on the use of the word "reef" in the singular. This great coral area is better described by the Admiralty Surveyors when they refer to the Great Barrier Reefs. J. A. S.

THE LAND THAT TIME FORGOT; adventures and discoveries in New Guinea. By MICHAEL LEAHY and MAURICE CRAIN. *London: Hurst and Blackett*, 1937. 8½×5½ *inches;* 288 *pages; illustrations and sketch-maps.* 12*s* 6*d*

New Guinea is the last stronghold of the Stone Age; and Mr. Leahy's book is aptly named. Practically everywhere else the white man's iron has blasted the black man's stone culture. Often his germs have blasted the black man's health as well, reducing proud fighting tribes to shadows of their former virile selves. In the nearby New Hebrides and Solomons about half the island population died out in a few decades. The New Hebridean of to-day is a sorry caricature of his proud uncivilized ancestors. This has not been the case with the great island of New Guinea, where for many years, until gold was discovered, European influence extended only around the coastlines.

It is sad that the discovery of gold must lead to the civilization and cultural decay of the last natives of the world living completely in an age of stone, but there is the consolation that in New Guinea, unlike most Pacific territories, there is a native-wise administration, and for the most part the prospectors treat the native fairly.

Leahy and Crain tell us how the former arrived raw and inexperienced in the country at the beginning of the famous goldrush to Edie Creek. They tell a fascinating story, simply and well. It is the modest tale of men who went through a country where no man had gone before, where even the coastal people are still savagely attacking government officers. Year after year Leahy and his partners travelled on difficult inland journeys. The extraordinary march of Leahy and Michael Dwyer right across the island to the Papuan coast is well worthy of a book in itself.

There are so many aspects of the book worthy of special mention that one

finds difficulty in selection. The story is not written for the geographer or for the anthropologist; yet both must find a wealth of interesting information concerning techniques of travel, and the behaviour of the "untouched" savages whom the Leahys encountered. Some of the natives imagined the white men gods; others claimed the carriers as the reincarnation of their personal dead. The farther they got from the coast the more valuable trade-shell, so prized by the islanders, became, and the more rarely was steel observed. Without supplying tediously detailed information on any point, Leahy and Crain give us an excellent broad pattern of the country, its peoples and the techniques and difficulties of travel over long periods and distances.

Of this country D'Albertis, the Italian traveller, once said: "It is easier to ascend the highest peaks of the European alps with an alpenstock than to cross an ordinary hill in New Guinea." He was exaggerating, but perhaps not very much. Leahy gives us an excellent impression of tropical work in a simple straightforward manner. A. J. M.

POLAR REGIONS

ARCTIC ESKIMO; a record of fifty years' experience and observation among the Eskimo. By C. E. WHITTAKER. *London: Seeley, Service & Co.* (1937). $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 260 *pages; illustrations and map.* 16*s*

On the book wrapper the publishers explain that the author has spent over fifty years among the Eskimo. Actually he first visited the Arctic in 1895 and, although he tells us all too little about himself, his knowledge of the Eskimo is very thorough. One must assume that he has never travelled eastwards from Hudson Bay, because no mention is made of the life in Baffin Land, Labrador, or Greenland. On the other hand, the mentality, life, and customs of the Eskimo living in the neighbourhood of Herschel Island, the Mackenzie Delta, Banks Island, and Victoria Island, are fully analysed and explained.

The first chapter explains his theories on the Eskimo's origin. This is not done in any controversial spirit; throughout the book the author is bent on producing the necessary information whilst leaving the reader to draw conclusions. The name "Eskimeg," which means "eaters of raw flesh," was given them by the Indians as a term of contempt. After they had been driven out of territory where the Indians claimed hunting rights, the Eskimo dwelt on the sea-coast. Their generic name for the Indians is "Itkilit," which means "nits of lice."

At first, the depressing but extremely vivid account of the Eskimo mentality, which finds "neither kindness nor harmony among living things," is somewhat upsetting. Then it becomes apparent that the author is describing the Eskimo as he first knew them—before the coming of Christianity and when their religion was one of fear alone. They thought that everything that died set free its *napak*, which was then forced to seek another home, and that all pain was caused by the unseen entrance of some small soul. The cure of any bodily distress was to slit the skin over the painful spot, thus letting the *napak* out again. Allied to this fear were superstitions and taboos. For instance when a seal was killed and brought to shore, the hunter's wife poured a little fresh water into its mouth, so that the departing soul might tell all the other seals and they also would want to be killed for the delight of a drink of sweet water. In Alaska, there were more taboos than farther east, due probably to the greater ingenuity of the shamans. Obedience to the taboos was enforced by threats of sickness, ill-luck, or even death; and, as the great shamans were credited with supernatural powers, their influence was very powerful. Early in this century missionaries travelled amongst the Eskimo and converted a great number. As a result,

their former fears now scarcely exist and traders bear witness to their integrity. They are always cheerful and make the most of the joy of living.

Various chapters, with numerous text illustrations, explain clearly the clothing and implements used by the Eskimo, the making and plans of snow houses, as well as the methods of fishing and hunting. Finally for those intrigued by the language, folk-lore or even "cats-cradles," there is plenty of good information. The contents are often poorly arranged and the map is rather inadequate, but the book is essentially interesting. N. A. C. C.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

AN INTRODUCTION TO WEATHER AND CLIMATE. By GLENN T. TREWARTHA. *London: McGraw-Hill Publishing Co.*, 1937. 9×6 *inches;* x+374 *pages; illustrations and maps.* 18*s*

In the Preface to this book the author explains that his aim was to meet the need expressed by geographers for a brief introductory text covering the field of weather and climate, apart from the other elements of physical earth. He makes no claim that the book is in the nature of a text-book of meteorology or of physics of the air.

The book is divided into two parts, the first dealing with "the elements of weather and climate," and the second with the climatic types and their geographical distribution. The first part might be described as a brief outline of what is normally known as meteorology. In four chapters, dealing respectively with air temperature, atmospheric pressure and winds, atmospheric moisture and precipitation, and storms and their associated weather types, the author describes the distribution of the meteorological elements rather than their causes. The treatment is of necessity brief, but is on the whole not unsatisfactory. At the end of each chapter the author gives detailed references to other books in which the reader will find fuller treatment of certain parts of the subject-matter of the preceding chapter. This is a particularly useful feature, and should be of real assistance to the reader who desires further information on some special feature of the weather. It is perhaps not to be expected that a writer who is not a specialist im meteorology will escape all the pitfalls of a by no means easy subject. The reviewer feels that the picture of the planetary circulation of the atmosphere shown in Fig. 17 might with advantage have been omitted. This is the diagram, so frequently given, representing the winds as a system symmetrical about the axis of the earth, showing for example the region of the middle latitudes of the earth as covered by uniform south-west winds. It has been conclusively shown by Exner and Jeffreys that such a system of winds could not persist, even on a globe whose surface was uniform. A much better representation of the winds of the globe is given by the author in his Fig. 25. The reader who desires further information on this particular point is referred to a paper by Dr. Harold Jeffreys in the *Quarterly Jour. Roy. Met. Soc.*, vol. 52, 1926, p. 85, or to a summary of this given by the reviewer in 'Physical and dynamical meteorology,' p. 391.

The description of the formation of cloud and rain (p. 115) might lead the reader to infer that all rising water-drops freeze when their temperature falls to 32° F. This is not so in actual fact, and water can exist in the liquid form down to temperatures 40° or 50° F. below freezing-point. Ascending liquid drops do not usually freeze until their temperature is below zero Fahrenheit.

The descriptions of weather charts and their uses are based on American examples. Here we find a fairly complete description of what is known as the "polar front" method now so extensively used in forecasting. The present

attitude of American forecasters, who are inclined to stress the differences between the air-masses shown on the chart rather than the pressure differences, makes the present a difficult time to give a brief account of the stage of development of the synoptic side of meteorology, but the author has succeeded in giving as clear and complete an account as is possible in the space at his disposal.

The second part of the book deals with the climatic types and their distribution. The distribution of the individual elements of weather over the globe having been described in the first part of the book, the author devotes the second part to considering the associations of the different elements over the surface of the globe. The classification of the climates follows the Köppen classification, but with some slight modifications. The deviations from the Köppen system are not great, the only difference which the reader will notice to a marked degree being the lesser emphasis placed upon the numerical limits specified by Köppen for the limits of the types of climate. One of Köppen's principal types, *Cw*, is completely omitted, the author feeling that this climate is not sufficiently distinctive to merit being set up as a separate type. The distribution of the different types of climate over the globe is shown by a chart, and the climate in each zone is described in reasonable detail. This part of the author's task has been well carried out, and the presentation is remarkably complete in view of its brevity, and is in addition interesting and clearly written. Only occasionally is it difficult to fathom the author's meaning, as, for example, when the description of a day's weather in the Amazon Valley is headed "Daily Weather Largely Sun Controlled." Whatever special meaning this may have has eluded the present reviewer. In general however the writing is clear, and the subject-matter well chosen. It was pleasing to note that the author does not rely on mean values alone, and that he draws special attention to the dangers of using annual means of rainfall in regions where, after a number of dry years, a single storm may bring inches of rain.

The book is well illustrated with diagrams and charts, and gives in an appendix climatic data for a small number of selected stations. Another appendix gives the Köppen classification of climates in detail, while the distribution of these types is shown on a chart of the globe. The book will meet the need which the author had in mind in writing it, and should be useful to University students at the Intermediate stage. D. B.

CARTOGRAPHY

IMAGO MUNDI. A periodical review of early cartography edited by LEO BAGROW and EDWARD LYNAM, Part II. *London: Henry Stevens, Son and Stiles*, 1937. 12×8½ *inches; 112 pages; illustrations and maps.* 10*s* 6*d*

The first part of this publication appeared in 1935, and one of its principal articles was noticed in the *Journal* for January 1936 (p. 90). The venture was a somewhat bold one, and soon met with a serious contretemps through the departure from Germany of Mr. Wertheim, its publisher; for though intended to be international, it was domiciled in Germany, its editor being Professor L. Bagrow, of Berlin. After some delay the difficulty has been successfully overcome, the firm of Henry Stevens, Son and Styles having undertaken publication in London, while a competent associate editor has been found in Mr. Lynam, of the British Museum.

The varied contents of the second number emphasize the value of such a publication to all students of early maps, not only for the more substantial contributions by well-known writers, but for the useful bibliographical matter

and record of important happenings in this field in all countries. We can here only briefly touch upon some of the more important topics dealt with.

Among the longer articles is one by Professor G. Caraci on a little-known Atlas by Vesconte Maggiolo, 1518. This is one of the earliest productions of that cartographer, completed in the probable year of his move from Naples to Genoa. Many years ago it was briefly described by Davezac, but had been lost to sight of late years: its present home is the John Carter Brown Library. The most striking item in the Atlas, to which Professor Caraci devotes special attention, is an incomplete planisphere on a fan-shaped projection closely resembling that used by Ruysch (1508) and also by Contarini and Roselli in the unique map of 1506 acquired by the British Museum in 1923 (*Geogr. J.* 62 (1923) 279 *sqq.*). There is a marked resemblance to these in the geographical details also, particularly in the representation of the Greenland–Labrador region as a prolongation of Asia. Caraci is able to show that the Museum map (which for brevity's sake he speaks of under Roselli's name only) must have been known to both the other map makers (though some other source must have been drawn upon) and that it continued to exercise an important influence on Italian map-making for many years. In speaking of the use of the equidistant polar projection by Glareanus the author is mistaken in saying that he showed the whole surface of the globe in a single circle, for the two hemispheres were treated separately. It is also puzzling to read that Ruysch's idea of the North Polar lands was "corrected" by Mercator, for it was precisely Mercator among the later map-makers who most nearly reproduced Ruysch's conception. And it might surely have been better to avoid speaking of Maggiolo as Vesconte only—the surname of a much older map-maker. But these are small points, and the study is of distinct value.

Another article, by H. Winter, of Berlin, is concerned with the same period, dealing primarily with the vexed question of the locality originally intended by the "Terra Laboratoris" of early maps. By a careful study of all the cartographical evidence the writer finds full support for the view of Björnbo and others that the land shown was meant for Greenland, and that the pre-Columbian voyages to which Larsen has drawn attention did not reveal any part of the continent proper. In the latter part of the paper he opens the wider question (suggested by the main inquiry) of the account taken by early map-makers of magnetic declination, either, as in one of the Reinel maps, by drawing an oblique meridian with a view to relating the geographical outlines to the true north, or, as in a Rotz map of 1542, by giving a different latitude-notation on the two margins. It is well that attention should have been called to this interesting subject, though the writer's argument is not always quite easy to follow, and he allows that in some of the maps cited there may be no reference to declination, but merely an orientation of the whole a little away from the north.

Limits of space preclude dealing at any length with other contributions of interest. Dr. G. E. Nunn returns to his favourite topic of the geographical ideas of Columbus, with special reference to Marinus of Tyre. He finds that Marinus had no influence on the view of the navigator as to the relation of Asia to Europe, and has no doubt that Columbus was really seeking Cipango, which, through his adoption of a minimum length of the degree, he placed within 750 leagues of the Canaries. Mr. A. E. Stephens has a note on one of the early seamen's Manuals preserved (in MS.) in the British Museum, which is of special interest for the section on the tides, the source of which is not obvious: in other sections the compiler was little more than a copyist. Professor Taylor calls attention to the 'De Ventis' of Matthew Paris, also to be found in the British Museum, in which the old writer tries to harmonize the classical

12-point with the seamen's 16-point system of wind-directions. As she says, the whole history of direction-terms deserves careful study. Mention should also be made of an elaborate series of time-charts of the history of cartography prepared by Dr. E. Raisz, of Harvard, and illustrated by minute outline-sketches of famous maps. The attempt was perhaps too ambitious to be altogether successful, and is marred by a good many inaccuracies, especially as to dates. Lastly a word must be given to a note by Dr. R. Uhden on early examples of an equidistant and a trapezoidal projection used for star-maps in a Vatican MS. of 1426. In speaking of the first known use of the equidistant projection generally accepted, he strangely overlooks its use by Glareanus in his MS. maps of about 1510.

The language used throughout is English, and the translation (if such was necessary for some of the articles) has on the whole been well done. There are excellent reproductions of early maps, but a small matter for regret is the complete absence of head-lines to the pages. We may hope that the venture will now attain the success it deserves, with no further set-back. E. H.

ECONOMIC AND HISTORICAL GEOGRAPHY

ANTHROPOLOGY: an introduction to primitive culture. By ALEXANDER GOLDENWEISER. *London: George G. Harrap & Co.*, 1937. 9×6 *inches;* xx+550 *pages; illustrations and maps.* 18*s*

In this revised and rearranged version of his earlier book 'Early civilisation,' Professor Goldenweiser retains the qualities which made it valuable to both student and layman. As before the general summaries and theoretical discussions of different aspects of primitive culture are developed on the basis of data presented in vivid sketches of particular peoples. In this respect the present volume surpasses its predecessor, for the author in selecting these concrete examples has drawn freely on the large body of detailed work produced in recent years. As the author returns as far as possible to the same ethnological examples in his discussions of economy, social organization, religion and art, a balanced view of a number of cultures is built up despite the sectional arrangement.

Although Professor Goldenweiser has some trenchant remarks to make on racial pseudo-science, the treatment of the data and problems of physical anthropology in Part I is perfunctory and haphazard. This section is marred too by an archness of style which disappears when the author gets down to the subjects that really interest him in the second part on "Primitive life and thought." This forms the main body of the book and here are to be found penetrating discussions of property rights, primitive art, supernaturalism and social and political organization. The problems of symbolism and of the incidence and occasion of realistic and geometric styles in primitive art are approached through well-illustrated discussions of the native art of the Plains, the North Pacific Coast, and the Pueblos for which the author has been able to draw on exhaustive special studies by others. It would be difficult to point elsewhere to so lucid a survey in so small a compass.

The fallacy of equating magic with primitive science is well expounded. Acts of magic may be precise and operate uniformly to achieve uniform results but the analogy of science does not extend beyond this, for the magical act is proof against lessons of experience. Moreover its essence is "the belief in the transcendent power of the magical act and of the will that controls it." In this connection examples are given to suggest that among ourselves the tendency to "superstition" is proportionate to the degree to which activities are, like those

of the savage, at the mercy of unforeseeable factors. The empirical distinction between magic and religion is made clear by analysis and illustration, but the treatment of ritual fails to emphasize the importance of inertia, accretion, and uncontrolled degeneration in divorcing the content of ritual acts from the avowed purposes.

In Part III the processes of cultural development and diffusion are discussed with a wealth of illustrative detail, and this section is also valuable for its short sketches of the aims and methods of many continental and American students whose work is little known in this country. C. D. F.

THE COLONIAL OFFICE; a history. By HENRY L. HALL. (Royal Empire Society. Imperial Studies, No. 13.) *London: Longmans, Green & Co.*, 1937. 9 × 5½ *inches;* xiv + 296 *pages; illustrations.* 12*s* 6*d*

The object of this book is to describe the activities of the Colonial Office, and its officials in the colonies, from 1830 to 1885, and, incidentally, to defend it from its detractors—for Dr. Hall, in the course of his researches on Australian history, came to the conclusion that a thorough study would end, as it has ended, in a justification. Recent historians have been less inclined to join in contemporary condemnation of the Office than their predecessors; but the words of Wakefield and Molesworth and Higinbotham made a deep impression on the public mind, and Dr. Hall was undoubtedly right in thinking that a full account of the work of the Office is the best corrective to their criticisms.

The literary problem presented by the subject was however difficult, and Dr. Hall has not been altogether successful in solving it. Perhaps he did not give himself time fully to digest the great mass of Colonial Office records he has read. He must have definitely decided not to make his book a constitutional or administrative study in the formal sense; but on the other hand it is not, in the usual sense of the term, a history. Its arrangement is topical, with chapters on the office, the staff, the governor, the colonial civil service, and a series of chapters on policy; but the limitations of this arrangement are illustrated by a chapter entitled "Difficult Dependencies," which is not so much a classification as a failure to classify. By not adopting a chronological arrangement Dr. Hall has not, perhaps, seriously lessened the value of his book as a storehouse of facts; but he has left it to others to draw conclusions which he surely was well qualified to draw. He does not, for example, clear up the doubt as to when the Office began to think of the colonies as fundamentally divided into self-governing or Crown colonies: he seems to take the division for granted. Nor does his method provide the best setting for judgments about the policy and influence of individuals: and on some of them—for instance, Glenelg—it is difficult to accept his judgments on the limited evidence he quotes. One cannot justly criticize his selection of first-hand material for study, nor indeed, where so much is new, the lack of indication as to what is and what is not new. It so happens that the chapter most likely perhaps to interest readers of this *Journal*—"The development of the Dependent Empire"—is also the chapter which, in the reviewer's opinion, contains the greatest proportion of interesting and suggestive new material. Though, as was only to be expected in a subject of such wide scope, Dr. Hall's background seems a little thin at some points, it is very rarely that he is inaccurate or misleading; but on p. 134 he has an extraordinary *obiter dictum* on slavery in conquered colonies, and he is misleading when he speaks of the colonies (on pp. 13 and 91) as "administered by the War Office" from 1801 to 1854, for the main part of the peace-time duties of the Secretary of State for War and the Colonies lay at the Colonial Office, not at the War Office. Students of the British Empire and its history will, in

short, find this book a useful and reliable guide, though they may wish that Dr. Hall had moved a little more boldly and freely over the field he has so painstakingly covered. W. P. M.

EDWARD WILSON: nature-lover. By GEORGE SEAVER. *London: John Murray*, 1937. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xii+222 *pages; illustrations.* 10*s* 6*d*

The name of Edward Wilson will always be remembered in association with that of Scott and his heroic companions. In the present volume however Mr. Seaver deals with the more personal details of Wilson's short life of thirty-nine years. From his early boyhood he was a lover of bird life and a watcher of wild nature; he was also a brilliant artist, as is well testified in the illustrations reproduced from his sketches in the present volume (and there is an exquisite series of his sketches of the Antarctic hanging on the walls of the house of the Society which gives some idea of his great artistic gifts). Perhaps more than anything else this little volume brings out the strength and charm of his character and the impression he made on all with whom he came in contact. When the members of the first expedition were being selected, it was only at the last moment that he was included as an extra medical officer and an assistant naturalist. Scott soon found that he was a leader of men and a most valuable source of sound advice, and these two became linked together in very close friendship for the rest of their lives. This volume, which is the second one by Mr. George Seaver on the life of Wilson, is almost entirely compiled from the journals which he left behind him but which have not hitherto been made public. They have been skilfully used by the author, who has only added what was needed to weave the story into a continuous narrative. This he has achieved with great success, and we have a most vivid and intimate picture of a strikingly lovable personality. It will give great pleasure to all those who had the privilege of knowing Wilson, and will form a memorial of one whose early death cut short a life of great promise. W. L. S.

TRADE CENTERS AND TRADE ROUTES. By EUGENE VAN CLEEF. (The Century Earth Science Series. Edited by KIRTLEY F. MATHER.) *New York—London: D. Appleton-Century Co.*, 1937. 9×6 *inches;* xvi+308 *pages; illustrations and maps.* 15*s*

The dust cover of this book says that "the terms trade center and trade route are used in a new and broader sense, the former including every manner of settlement and the latter including such phenomena as language, the motion pictures and the radio." The first part is thus simply urban geography under another name. Settlements are classified according to several different schemes, the trade centre is defined as "an aggregation of people who derive such advantages as co-operative effort may yield," and urban patterns and functions are discussed and illustrated. Special attention is given to ocean ports as trade centres. The book does not pretend to be an advanced treatise (though the preface says that it is the result of fifteen years' observation and research), and much of its subject matter is of an elementary and trivial nature. Particularly is this the case with Part II, Trade Routes, which is so superficial as to be almost useless to the average student and not very informative for the man in the street. There are scrappy accounts of the world's major overland and ocean routes, and some not very relevant chapters on language as a "basic trade route," motion pictures, newspapers, and postal services.

The book as a whole is rather jejune and unsatisfying, and there are numerous details which are unpleasing. The coinage of new and not always euphonic terms proceeds rapidly in America, and in this particular work the introduction

of "centrepôt" (meaning an inland entrepôt), "urblet" (a small satellite town), and "agri-trade center" will offend English ears; whilst it is surely an unwarrantable misuse of the term *hinterland* to say (p. 34) that Manchester's hinterland includes the cotton belt of the United States, especially when only a few pages earlier (p. 30) the term has been defined as "the region about." It also seems scarcely logical to state (p. 31) that "a trade center plus its continuous hinterland may be defined as an *urban region*." If we pass over, as a common error, the statement on p. 120 that New York lies "opposite Europe," we can scarcely forgive that on p. 216 which says that the speed of tramp ships is "nine to ten knots an hour." We might rightly question, too, the opinion that the Cape-to-Cairo route "is the most notable trade route of Africa," and we must deplore, in view of recent events, the inclusion of a section on trans-polar air routes which omits completely all reference to climatic conditions. And how many Americans will agree that Salt Lake City is a type example of a "Cathedral town"?

The illustrations are not a strong point. Most of them are not original, and many have suffered severely from over-reduction, Figs. 34 and 49 in particular being almost illegible. The bibliography of "works in English" includes practically nothing except American sources. In the study of urban plans and functions there is no mention of the work of Dr. R. E. Dickinson; whilst the section on ocean trade routes would have been raised from the level of a collection of platitudes by a few ideas from Professor Sargent's classic 'Seaways of the Empire." S. H. B.

GENERAL

SINABADA. By ELINOR MORDAUNT. *London: Michael Joseph*, 1937. 9×5½ *inches; 352 pages. 10s 6d*

It seems strange to read that when Mrs. Mordaunt wants to write she is "like a hen looking for a quiet place in which to lay an egg," for her writing does not suggest tranquillity. The reader is alarmed on occasions, and wonders what is coming next. It would be difficult to find another volume more full of incident and experience, so much of which is unpleasant for the heroine.

The first few chapters are devoted to what the authoress regards as an unconventional childhood. Her travels abroad date from the loss of one to whom she was deeply attached. Going out to Mauritius she marries, but after two-and-a-half years leaves her husband and returns to England where her son is born. Thereafter she travels unremittingly, supporting herself and the child by needlework and writing books, and heroically surmounting one difficulty after another. During this period, having first spent eight years in Australia, she visits, among other places, Panama and Tahiti, the Friendly and Samoan Islands, Fiji, and the Trobriands, where she won for herself the title of "Sinabada" or "Lady King." Mrs. Mordaunt has personal gifts which in the course of varied experience caused her inconvenience from time to time. On two occasions only does she appear to have been seriously embarrassed. One of these was the result of insisting on knowing why she should not travel by a certain steamer. The reason was conclusive. The other occasion the reader may discover for himself.

For a brief summary of this interesting volume the epitaph might be taken which the authoress saw on a wooden cross in Ballarat: "She did her damndest. Angels could do no more." The book needs no illustrations. W. G. G.

THE MONTHLY RECORD

EROSION SURFACES IN DEVON AND CORNWALL

The publication in the *Annales* of the Société Géologique de Belgique, December 1936, of a paper on the geomorphology of Cornwall and South Devon, by Paul Macar, is of interest as expressing the views of a foreign observer on a branch of study which, directly or indirectly, has been the subject of recent papers by three English investigators.[1] M. Macar outlines the existence in different areas of Cornwall of a series of plateaus, or platforms, with their upper margins at 430 feet, 750 feet, and 1000 feet above sea-level. Erosion surfaces at all these altitudes have been recognized for some considerable time by workers of the Geological Survey, but M. Macar suggests that a further planation feature is to be found also at 1200 feet in Bodmin Moor. He does not seem to have distinguished the two further planation levels which have been suggested as existing at about 600 feet and at just below 200 feet. The four platforms, which he recognizes, are regarded by him as being of marine origin: this is in accordance with the views expressed by the English writers, who attribute a similar origin also to the 200-foot and 600-foot platforms.

The Crousa Common sands and gravels, nowhere exceeding about 12 feet in thickness and with their maximum elevation at approximately 370 feet, are a source of difficulty to M. Macar, especially in view of their position on the 430-foot Lizard platform at about 7 miles from the nearest bluff delimiting its inner edge, and of the intervention of a considerable area at and below about 200 feet in the Helford River area. He rightly rejects the theory that the Crousa deposits are of deltaic origin, but asks why they should have escaped denudation over such a comparatively small area. His suggested answer is that the 430-foot platform, which normally slopes gradually down to about 240 feet, has here been up-warped, and that its lower section near the Helford River has been down-warped. The latter suggestion is made largely because he cannot understand how such a comparatively short river as the Helford can have accomplished a widespread general lowering of the level of the region. If he had been aware of the suggested 200-foot platform, this problem might never have occurred to him. The Helford ria is developed largely in an area of Gramscatho rocks which are relatively less resistant to the forces of denudation than are the Carnmenellis granite immediately to the north, in which the bluff terminating the 430-foot platform occurs, or the Lizard complex of rocks close at hand on the south. The Crousa deposits principally overlie areas of gabbro which, being a rock notably resistant to marine erosion, may have formed either an off-shore bar or a shallowing in the 430-foot sea. The preservation of these deposits may be due to no more complicated a factor than that of differential erosion and its effect on the varying types of rocks which make up the Lizard complex.

At Polcrebo, about 4 miles north-west of the Helford depression, on the Carnmenellis granite area deposits similar to those of Crousa Downs occur at between 480 feet and 499 feet above sea-level. M. Macar, imbued with the idea of warping, suggests that these Polcrebo deposits were also uplifted by tectonic means. But in this case also, if the theory of the suggested 600-foot platform

[1] Green, J. F. N., "The terraces of southernmost England," *Q. J. Geol. Soc.*, vol. xcii, pp. lviii–lxxxviii; Gullick, C. F. W. R., "A physiographical survey of West Cornwall," *Tr. R. Geol. Soc. of Cornwall*, vol. xvi, pp. 380–99; Balchin, W. G. V., "The erosion surfaces of North Cornwall," *Geogr. J.* 90. 52–63.

is accepted, there is a more likely explanation. Local evidence indicates that the Polcrebo ridge was either an isolated portion of that platform or an off-shore bar in the 600-foot sea, so that the gravels were probably laid thereon during that transgression. Moreover, within about half a mile of the Polcrebo deposits there is an example of a perfectly normal section of the 430-foot bluff and platform. The theory of the local warping of that platform can therefore be discounted in the Helford area. The continuity of the platform at the height of 430 feet is indeed one of its most outstanding features in the areas described by the different English investigators.

In view of the wide extent of the 430-foot, 600-foot, and 750-foot platforms, all of which have been identified at least as far east as the estuary of the river Dart, it is somewhat surprising to find it postulated that sub-aerial forces have been dominant in moulding the features of the Torquay and Dartmouth regions of South Devon. Here again much of the evidence might have been re-marshalled if M. Macar had been aware of the suggested 200-foot and 600-foot platforms. As he admits, his own hypothesis is not entirely satisfying, but he claims that it does, at least, take into consideration the apparent differences between the forms of relief of West Cornwall and of South Devon. Again however a feature noted by M. Macar may be attributed to the varying resistance of individual rock-types to the forces of denudation. In South Devon the rocks are frequently less resistant to denudation than are those of West Cornwall, so that the aspects of marine denudation have not been so well preserved. Furthermore there is a greater variety of rock-types in South Devon and, as these tend to outcrop in parallel east-to-west bands, the more resistant beds form the elongated ridges which M. Macar notes as planated, but does not seem to recognize as preserving evidence of marine planation.

Even the 430-foot platform must somewhere have an end. This end may possibly be in South Devon, but, if it is, what becomes of the suggested correlations of the 200-, 430-, and 600-foot platforms of Western England with those of somewhat similar elevation noted in the London Basin? Such correlations, it should be remembered, are based not only upon the somewhat specious evidence of proximity of altitude, but also upon the geological evidence bearing on the probable age of the formation of each of these planation features.

F. R. G.

THE EASTERN DORA BALTEA BASIN

In the *Scottish Geographical Magazine* for July Professor A. G. Ogilvie describes the natural and cultivated vegetation of the Eastern Dora Baltea Basin which descends from the Pennine Alps. The region was selected for study as it presents in a short distance a great range of altitude and climatic zones. Two months were spent in the field and use was made of the recent revision of the 1 : 25,000 map, particularly in regard to the upper limit of tree growth which was difficult to examine in the time available for this survey. The results of this reconnaissance have been summarized in a coloured folding map on the scale of 1 : 100,000 (save for the morainic region south of Ivrea which is on half that scale). The two valleys of the basin, the Evançon of the west and the Lys of the east, despite their general parallel courses show remarkable differences in the vegetation pattern. The former stream has right-angle bends in its valley which provide differing aspects, in part responsible for these contrasts. The major factor however is the covering of ancient morainic deposits which, with the broader flat valley, have permitted the development of irrigated hay meadows in the Evançon basin.

The natural vegetation of the two river valleys has been profoundly modified

by clearing for agriculture and by wood-cutting. The altitude range carries the valleys above the limit of tree growth into the zone of alpine vegetation. Longitudinal profiles of the Evançon and Lys, with projected profiles of adjoining mountains, give the approximate limits for the different tree zones. The lowest is that of the oak-chestnut group, largely dominated by the latter as the oak now rarely occurs. The limit for this zone is at about 1100 metres—the precise upper limit varying with the aspect. Beech reaches 1750 metres in the Lys valley but is absent in the Evançon valley, probably owing to the drier climatic conditions. The trees which reach the greatest altitude are the birch (2200 metres) and the rowan (2100 metres), while sub-tree growth of the elder and alder occurs up to the alpine vegetation. The Scots pine is chiefly present in the Evançon basin and tends to concentrate on the sunny slopes. It can thrive where the soil is poor, whereas the spruce is found in the shade where good soils occur. The dominant conifer is larch, since its presence is not incompatible with pasture lands.

The Eastern Dora Baltea Basin has a dense rural settlement and all land that can profitably be utilized is under crops. The chestnuts have been allowed to remain on parts of the morainic foothills as they provide a subsidiary crop, but where the ridges are free from boulders the vine is cultivated. The morainic ridges can be clearly picked out on the land utilization map. Behind the circle of the moraines the utilization varies according to the soil conditions. The damper flat lands are used for hay, the drier terraces for wheat, maize, and interplanted fruit trees. Among the moraines of the south and east, irrigation water is led in by canals from the Dora Baltea and used for paddy rice. In the confined part of the valley above Settimo Vittone agriculture is limited on the right bank, but on the sunny left bank crops and irrigated hay are grown on the valley floor, and chestnut and vine flourish on the slopes. In the upper part of the Lys valley there is little cultivation, the crops being chiefly rye, barley, and potatoes; the drier Evançon valley is cultivated to a greater extent, in addition to the extensive irrigated hay meadows. These hay meadows are irrigated by canals built for crop production when the valley was a self-supporting unit. Modern canal construction has been limited here to providing the hydro-electric power which supports the industries of the Dora valley. The modern tendency has been towards depopulation of the upper valleys and the land used for raising cattle. The upper hamlets, if not deserted, are now being used as *mayens*, or temporary dwellings for hay-makers.

RAINFALL AND ALTITUDE IN SOUTHERN ITALY

A paper by Mario Ortolani "Sulle variazioni della piovosità con l'altezza," published in the *Bollettino della Reale Società Geografica Italiana* for April 1937 describes and compares in considerable detail the average altitudinal variations of rainfall in Sardinia, Sicily, and the eastern or Ionian slopes of Calabria on the Italian mainland. These three regions are selected for comparison because they resemble one another in their Mediterranean type of climate and also in orographic structure. With the exception moreover of Mount Etna the highest mountains in each region attain much the same elevation, viz. Gennargentu in Sardinia 1834 m., Madonie in Sicily 1977 m., and Pollino on the mainland 2271 m. In each region most rain falls at an altitude of 700 m., though Sicily is decidedly drier than Sardinia, and Sardinia than the Ionian slopes of the Calabrian Apennines except between 850 and 1000 m. Between the base of the mountains and the belt of maximum precipitation the rate of increase of rainfall for every 100 m. of altitude is 51·5 m. in Sardinia, 51 m. on the mainland, and only 20·5 m. in Sicily, the last being a much smaller

gradient than is normal for temperate latitudes, due to the general dryness of the island.

It is indicated that the belt of heaviest rainfall is influenced by diverse factors such as the profile of a mountain, its orientation with respect to the prevailing winds and the general humidity of the region. Thus in relation to the last-named factor it is pointed out that the western or Tyrrhenian slopes of Calabria are much wetter than the eastern or Ionian slopes, and accordingly the altitude of heaviest rainfall is 200 m. lower. In each of the three regions studied it is found that as a rule the belt of maximum precipitation lies higher on the higher mountain masses.

A PROBLEM IN JUBALAND

We have received from Colonel G. C. Hill a description of some stone ruins examined by him in Northern Jubaland, now part of the Regione di Giuba in Italian Somaliland. Some years ago, while travelling with Captain H. D. Tupper Carey, he came upon these ruins at a place known as Bendiger, in approximately 42° 10′ E., and 3° 20′ N. They lie in the bush and are overgrown by thornbush and trees, and consist of a circular stone wall, averaging 8 feet in height, with a circumference of about 3 miles. The wall is loopholed at the gateways, and is surrounded by a large ditch. No traces of former buildings were seen within the enclosure. Outside, there were a number of piles of lozenge-shaped stones, 10 or 12 feet long and 5 to 6 feet wide, which appeared to be graves, and what was apparently the remains of a roofed building, perhaps the tomb of an important person or a guard house. Photographs of these remains by Colonel Hill have been placed in the Society's collection.

As the camels were carrying a limited supply of water only, he was unable to pursue his investigations. He concluded that the stone enclosure may have been used as a standing camp on the slave route from Abyssinia to the coast. The local inhabitants, the Marahan Somali, are nomadic, and do not build dwellings. At the present time there is no permanent water within 10 miles of the site. Somalis, whom Colonel Hill met on the following day, said that they knew the ruins and understood that many years before they were connected with men of light-coloured skin and great stature.

This report by Colonel Hill is of much interest in relation to the statements of the late Colonel R. E. Salkeld in his paper on Jubaland (*Geogr. J.* 46 (1915) 51–4). When crossing the Wajheir district, about 150 miles south of Bendiger, he noted wells, 4 feet in diameter, cut through solid rock to a depth of 40 feet, and stone cairns of a maximum size of 100 yards in circumference and 30 feet high, single stones in the larger being at least a load for a man.

"After leaving Wajheir, we did not again meet with the cairns till we were close to the Marti plateau. The eastern slope of the plateau was covered with them. The Hon. K. Dundas, who was with me, informed me that he had observed similar cairns in the country south of Lake Rudolf. The cairns are said to be the graves of a race called the Maanthenle, who are supposed to have been responsible for the Wajheir wells, the artificial rain-pans, and the wells at Afmadu. It is very curious that people who could bore through rock should have left no remains of stone buildings. The natives report them to have been a race of giants and to have used iron hoes three feet across."

A further note upon the Maanthenle by Colonel Salkeld was published in the *Journal* for November 1921. From his observations he concluded that they must have occupied the area west of the Juba, between the Webi Dawa and the Tana, and as far west as the Lorian swamp. The ruins described above fall in the north of this area. Colonel Salkeld also mentioned that at Burkow,

80 miles south of Kismayu, there are the remains of a large circular stone wall and of stone houses. He attributed these to the Gurre, who inhabited the country before the Galla and Somali inroads, and who are now mainly represented by a remnant, the Rendile, which took refuge in the Lorian swamp area. He believed these people to have succeeded the Maanthenle. It appears possible however that the people now represented by the Rendile were responsible for these stone buildings and wells. The Rendile are described by Arkell-Hardwick ('An ivory trader in North Kenia,' ch. XIII) as "tall and well built, with slim and graceful figures and light clear skins. . . . Their distinctly Semitic features bear little resemblance to those of the typical negro. . . . They somewhat resembled high-bred Arabs in general appearance." They are a pastoral people with large numbers of sheep, goats, and camels, living in villages of low flat-topped huts of bush and reeds, around a circular enclosure for their flocks, and surrounded by a strong thorn *bomba*.

Stories of these "Maanthenle" were heard by Colonel Hill, and also by other travellers, for example, by I. N. Dracopoli and C. Wightwick-Haywood, whose accounts agree in the main with the above statements.

Evidence of the existence throughout East Africa of stone enclosures, hut circles and cairns, associated with terracing and irrigation has been collected by G. W. B. Huntingford (*Antiquity*, 7 (1933) 153). These are ascribed traditionally to an ancient race coming from the north, and apparently of Hamitic rather than of Bantu origin. Mr. Huntingford proposes for this civilization the name "Azanian," and suggests that it flourished in north-east Africa during the first seven hundred years A.D., was driven southwards into Kenya by Islamic invaders, and came to an end in the fourteenth and fifteenth centuries. He would apparently include the "Maanthenle" among these "Azanian" people. None of the remains noted by him however are comparable in size to that described by Colonel Hill, which suggests a pastoral rather than an agricultural people skilled in irrigation. There is at present no evidence upon which the site at Bendiger can be dated. It would be useful if other travellers in northern Kenya or Jubaland could supply further details which might assist in solving the interesting problem raised by Colonel Hill.

NEW LIGHT ON AN OLD ANTARCTIC VOYAGE

In his presidential address to the Linnean Society published in a recent number of its *Proceedings*, Dr. W. T. Calman recalls the work of James Eights, who was surgeon-naturalist to the American expedition to the Antarctic in the brigs *Seraph* and *Annawan* during the summer 1829–30.

The scanty official report by Captain Pendleton, commander of the expedition, published in Fanning's 'Voyages round the World,' does not mention Eights though the names of his two colleagues Reynolds and Watson are given. That report also fails to record landings in the South Shetlands, notes of which Dr. Calman quotes from the appendix to a zoological paper by Eights in the *Transactions* of the Albany Institute for 1833 and reprinted with notes on the life and work of Eights in an article by Dr. J. M. Clarke in the *Scientific Monthly* for 1916. It is apparent from this appendix that Eights had landed on Deception Island and other islands of the South Shetlands where he made valuable notes on the geography as well as the geology, botany, and zoology of those inclement lands. This work seems to have escaped the attention of all writers on the history of Antarctic exploration, though one of Eights' papers published in 1856 is listed by Bjaarne Aagaard in his almost exhaustive bibliography to "Fangst og Forskning i Sydishavet."

While Dr. Calman's address gives the first place to the discovery by Eights

of a ten-legged sea-spider, a genus never found again until Bruce's work on the *Scotia* seventy years later, he refers to other points of interest, noting that Eights had found part of a fossil tree, the first known fossil from the sub-Antarctic islands south of South America. A vivid description, also quoted, of the wild coast of rock and ice-cliff makes one wonder whether the report which Eights stated in 1834 that he was preparing for a full account of the work of the *Seraph* and *Annawan* by J. N. Reynolds ever saw the light. An interesting reference is given to a meeting by the *Seraph* and *Annawan* with a third brig, the *Penguin*, apparently on the same service at Staten Island, but the routes followed by all of the three ships and the discoveries, if any, made by them still remain largely matters of conjecture. Though approved by the U.S. Government the expedition was dependent for funds on the sale of seal-skins collected on the beaches visited, the locality of which it was not to the interest of the sealers to specify too precisely. H. R. M.

COLUMBUS AND THE DISCOVERY OF MAGNETIC DECLINATION

Dr. A. Crichton Mitchell examines the question of the discovery of magnetic declination in *Terrestrial Magnetism* for September 1937. The greater part of the paper is devoted to a discussion of the claim frequently advanced that Columbus discovered the magnetic declination, or at least found that it diminished to zero and then turned westwards as the Atlantic was crossed. It is now generally accepted that the declination was known before Columbus' time, and the main problem at issue is the significance of the observations said to have been made by Columbus on his first voyage in 1492. The writer examines the two sources of our knowledge, neither of which are entirely satisfactory: the Journal as recorded by Las Casas and the Life by Ferdinand Columbus. Dr. Mitchell gives reasons for believing that the measurements were made from the Pole Star, assumed to be true north, and concludes that the observations on September 13–14 were consistent with a westerly deviation of 1° or possibly 2°, and that those on September 17–18 gave a deviation of $3\frac{1}{4}°$. His final conclusion is that as this was "too small for measurement by the rough methods then in vogue, . . . the true meaning of these observations is that the compass needle continued to point nearly true north. So far, then, nothing had actually been observed which proved the existence of a magnetic declination."

As to the conclusions that Columbus drew from these observations, the writer suggests that it was about this time that Columbus "began to realise that the star Polaris was not fixed in position, . . . and that it revolved round the celestial pole as do the other stars," and concludes that "it is thus possible, though not probable, that the correct interpretation of the phenomenon may have occurred to Columbus." He thinks therefore that "whereas they [the sailors] had known, and been accustomed to, an easterly declination off the coasts of western Europe, they now found that this would appear to have nearly vanished, and possibly become a westerly declination" (p. 263).

These conclusions raise some points of interest. It seems unlikely that Columbus, or at least his pilots, were unaware of the movement of the Pole Star. It is difficult to date the introduction of the "regiment of the pole," but the movement of the Pole Star was certainly known at least in the fourteenth century, and rules for it were contained in the so-called Munich *Regimento* of 1509, which was probably based upon earlier Portuguese experience. There is also no doubt that a few years later, Columbus thought that he had observed a considerable change in the behaviour of the compass needle 100 leagues west of the Azores (see the "Haiti" letter of 18 October 1498) though the exact date

of these observations is not known. It is possible that Columbus allowed for the movement of the Pole Star, and, through faulty observations, arrived at the erroneous results rejected by Dr. Mitchell.

The writer's general conclusions are that Roger Bacon was aware that the direction of the magnetic needle does not coincide with the geographical meridian; that not later than 1450 makers of sun-dials in Germany allowed for this deviation; and that no original observation, discovery, or instrumental improvement, down to the sixteenth century, can be associated with the name of any particular person. G. R. C.

THE ASSOCIATION FOR THE STUDY OF SNOW AND ICE

The Association for the Study of Snow and Ice, under the chairmanship of Mr. Gerald Seligman, originated from the desire of the British members of the International Commissions of Snow and Glaciers to establish a permanent body in this country to encourage research on the practical and scientific problems of snow and ice, and to stimulate general interest in the subject. The Association therefore welcomes not only scientific investigators but all others, mountaineers and ski-runners, who have a practical interest in the study of snow and ice. In an article in the *Scottish Geographical Magazine* for November 1937, Mr. Gordon Manley explains how much of the work to be undertaken is open to, even dependent on, the amateurs who prefer "field work in the country to library studies in the town"; and he describes, with particular regard to Scotland (where the raw material exists in greater proportion than elsewhere in these islands), some of the problems awaiting solution.

Particulars as to membership and meetings can be obtained from the Honorary Secretary, Miss P. B. Lapworth, Warren Close, Coombe Hill Road, Kingston Hill, Surrey.

OBITUARY

EDMUND TILLOTSON RICH

Colonel E. T. Rich, C.I.E., who died suddenly in London on 28 November 1937, at the age of sixty-three, had been a Fellow of the Society for thirty-four years. After receiving the Pollock Medal at Woolwich, he was in the Royal Engineers in July 1893, went to India two years later, and from then on spent almost the whole of his career in the Survey of India, in which he rose to be Director of the Burma Circle before his retirement in 1929.

Much of his exploration and survey was carried out on the frontiers of India. From 1905 to 1909 he was working on the North-West, and as survey officer served on both the Zakka Khel and Mohmand expeditions of 1908, when he was slightly wounded, and for his services on which he was promoted brevet-major. During the first months of the Great War he served in Burma; but in 1915 he was back again on the North-West Frontier, and at the end of 1916 he took a small survey party for a six months' reconnaissance of the alternative routes between Bandar Abbas and Kirman in South Persia, an operation which led to the selection of the Tang-i-Zagh route, the road through which was under construction at the end of the War. In June 1918 Major Rich arrived at Kirmanshah to take charge of the survey party which had been formed to accompany General Dunsterville's mission to the Caspian. After setting his various detach-

ments to work on the long lines of communications, he went on to Baku for survey in that neighbourhood. On the evacuation of that place, he personally supervised the survey of Western Persia, until, at the end of the War, he was appointed to organize a map drawing and compilation section for the advanced G.H.Q. of the Black Sea Army at Tiflis. For his services during the War he was mentioned in despatches and made a C.I.E.

Colonel Rich was a great linguist, and besides his knowledge of Urdu, Pushtu, and Persian, he was able to converse in Yunnanese and several dialects of Burma—Kachin, Maru, and Lisaw. Most of his post-War service was therefore spent in Burma, where his knowledge of Burmese customs was of great value, particularly during the operations in "the Triangle." He was a keen explorer throughout his career and did much to encourage a spirit of adventure in younger officers who served under him. They would laugh at and with him at his little economies which alone made possible his big generosities. Capable of hard living on service or in the field, he could enjoy the more sumptuous fare, and responsibilities, of civilization. A keen and openhanded Freemason, he rose to be Grand Warden of the District Grand Lodge of Burma. On his return to England, after his retirement in 1929, he was a regular attendant at Geographical Club dinners and at evening meetings of the Society.

MEETINGS: SESSION 1937–38

Third Evening Meeting, 29 November 1937. The President in the Chair

Elections: F. M. Dimas-Aruti, D.DS., LL.B.; Miss Eleanor A. J. Church; Captain Hewitt St. John Clay; John Douglas Coombe; Martin de Selincourt; Viscountess Dawson of Penn, C.B.E.; Miss Susanne Rouviere Day; Prentice G. Downes; Mrs. E. A. Hay; Lionel Higgins, F.R.E.S.; Miss Maureen Margaret Hudson; L. J. Jenkins, F.C.I.I.; Mynorryd Jones; Harry Cecil Myers, M.B.E., F.Z.S.; Cyril Raymond Nason; James Daniel William Newham, B.SC.; The Reverend Leslie A. Newman; V. Peniakoff; Miss Barbara N. Tappenden, B.SC.; Lady Hodder-Williams

Paper: Recent reconnaissance flights in the Antarctic. By Mr. Lars Christensen

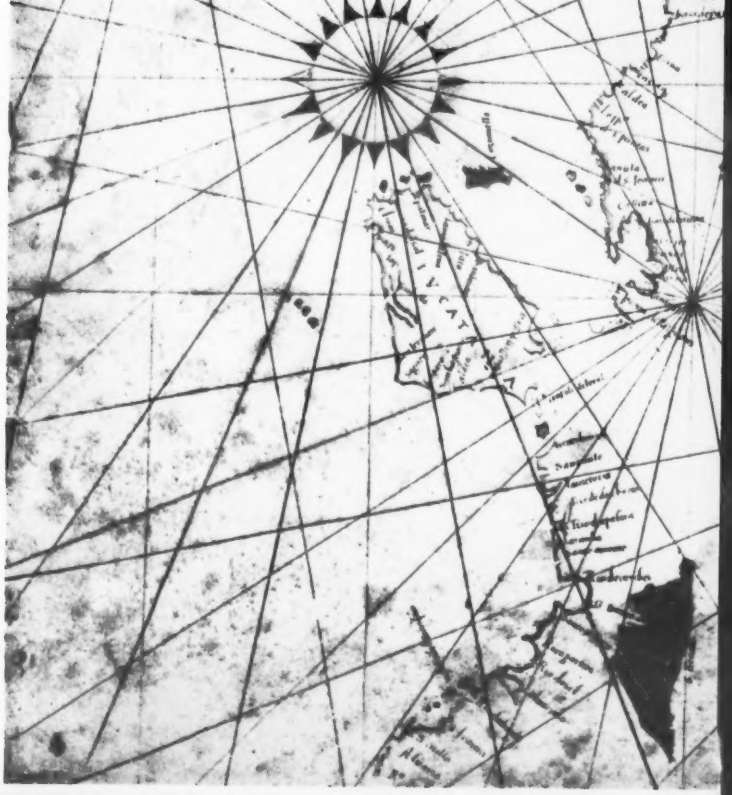
Second Afternoon Meeting, 6 December 1937. The President in the Chair

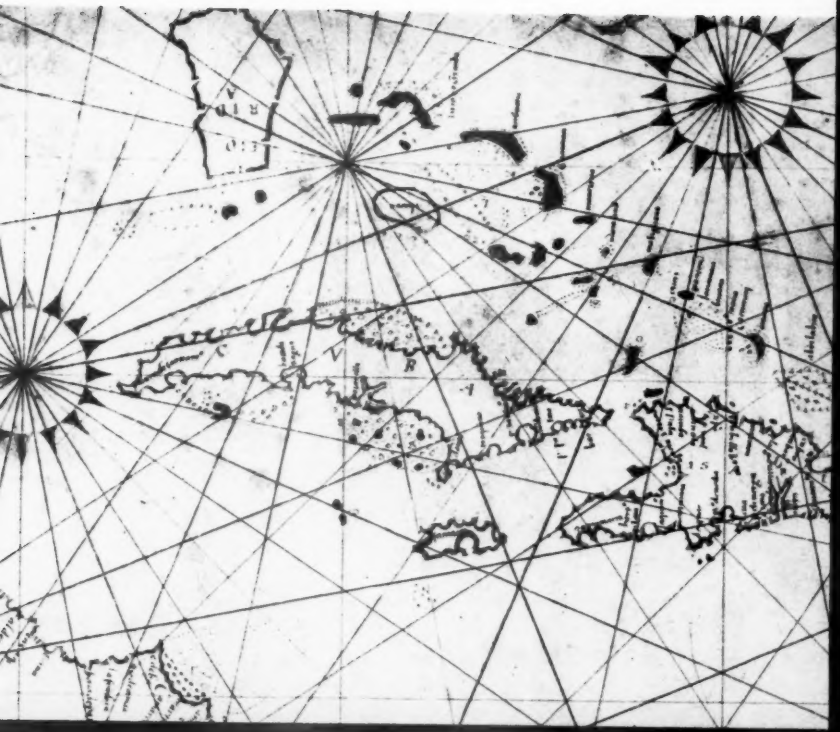
Papers: Scientific work of the British Graham Land Expedition: preliminary account. By the Rev. W. L. S. Fleming, Mr. A. Stephenson, and Mr. G. C. L. Bertram

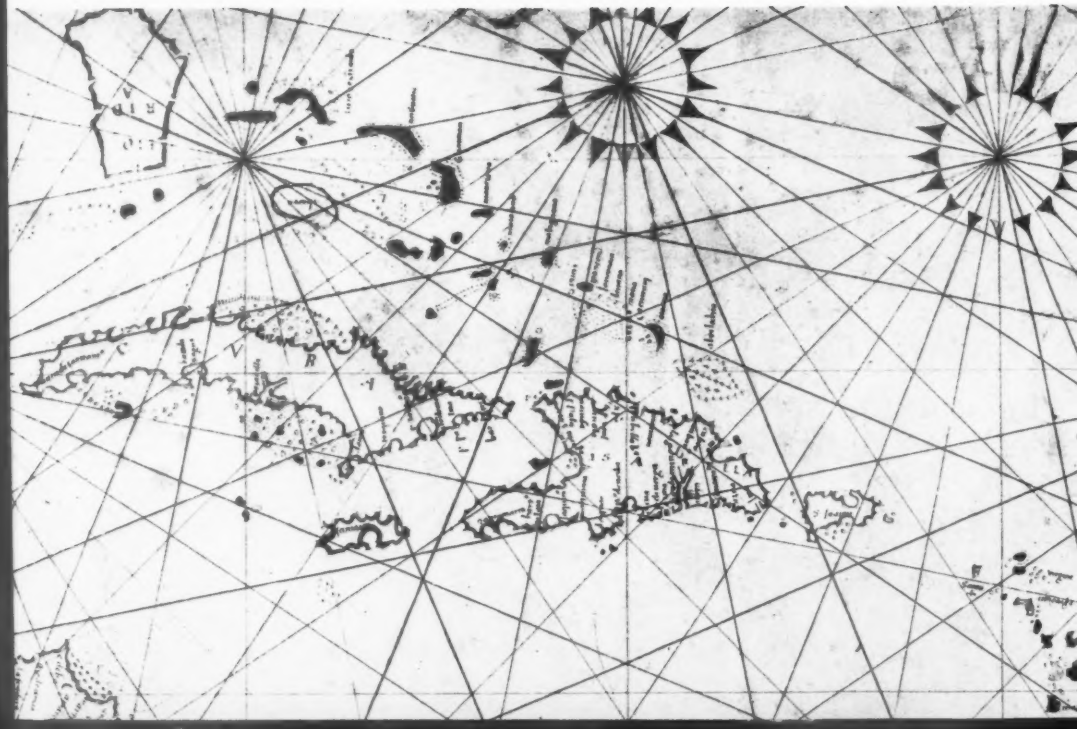
Fourth Evening Meeting, 13 December 1937. The President in the Chair

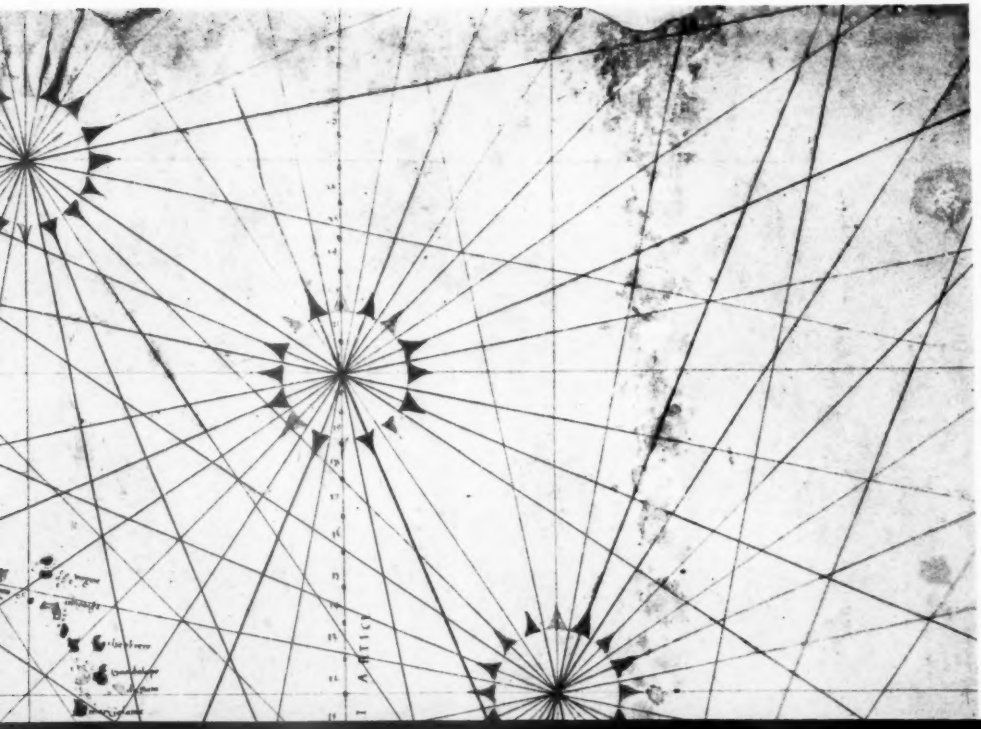
Elections: Lieut. H.H. Maharaj Rana Shri Rajendra Sinhji of Jhalawar; Cecil Rupert Agar; Eric Annerley; Dr. Elizabeth Bolton, C.B.E.; Miss Mary Alice Crowden; John Peter Ford; Mrs. Cecil Forster; Ernest Everard Gates, M.A.; William Edward Molineaux Guy; Norman James Hepden; Captain F. O. Hodgkinson, I.A.; Max Holt; Mrs. M. G. Holt; John Myers, B.SC.; Miss Marion Evelyn Odell, M.SC., F.L.S.; Charles George Pye; Dr. George R. Radmore; Harry Snyder; Miss Helen Catherine Stewart; Miss Josephine H. J. White

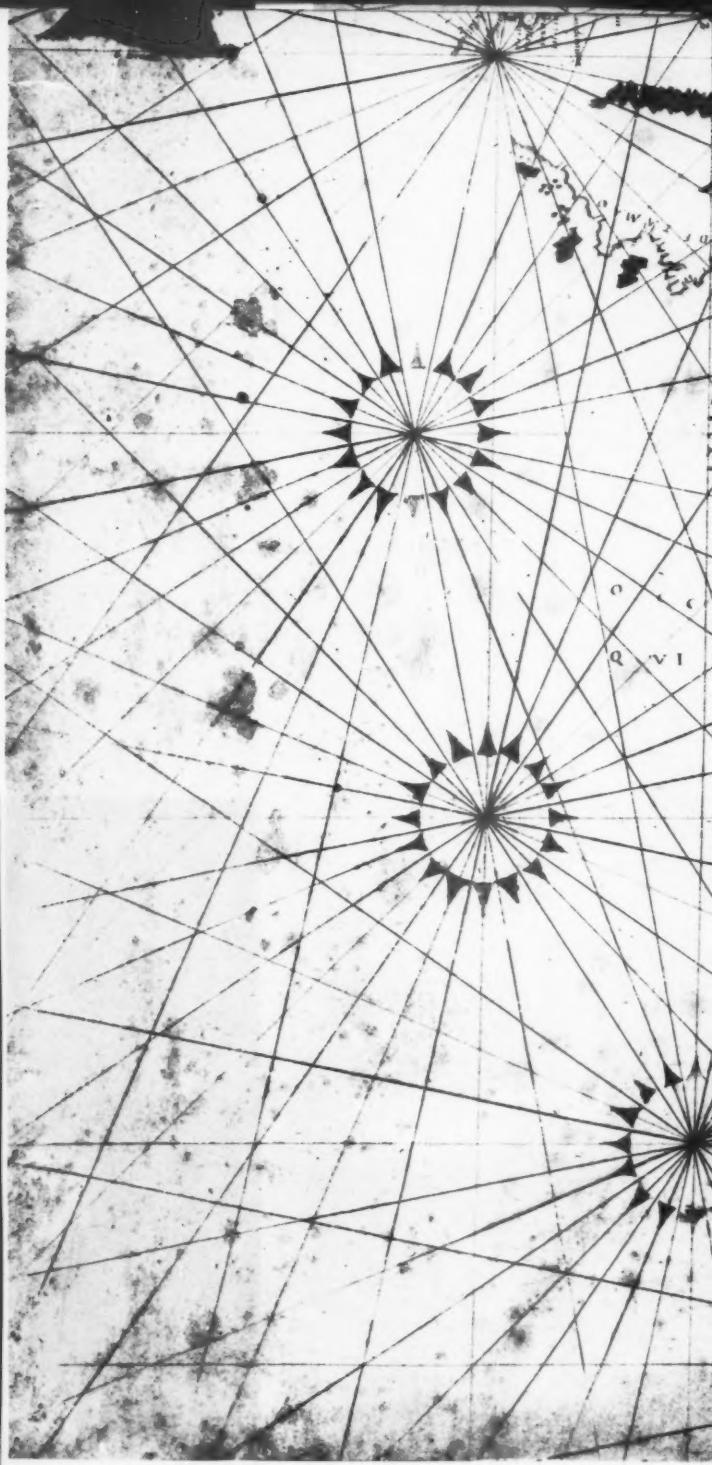
Paper: Lhasa in 1937 and the ascent of Chomolhari. By Mr. F. S. Chapman



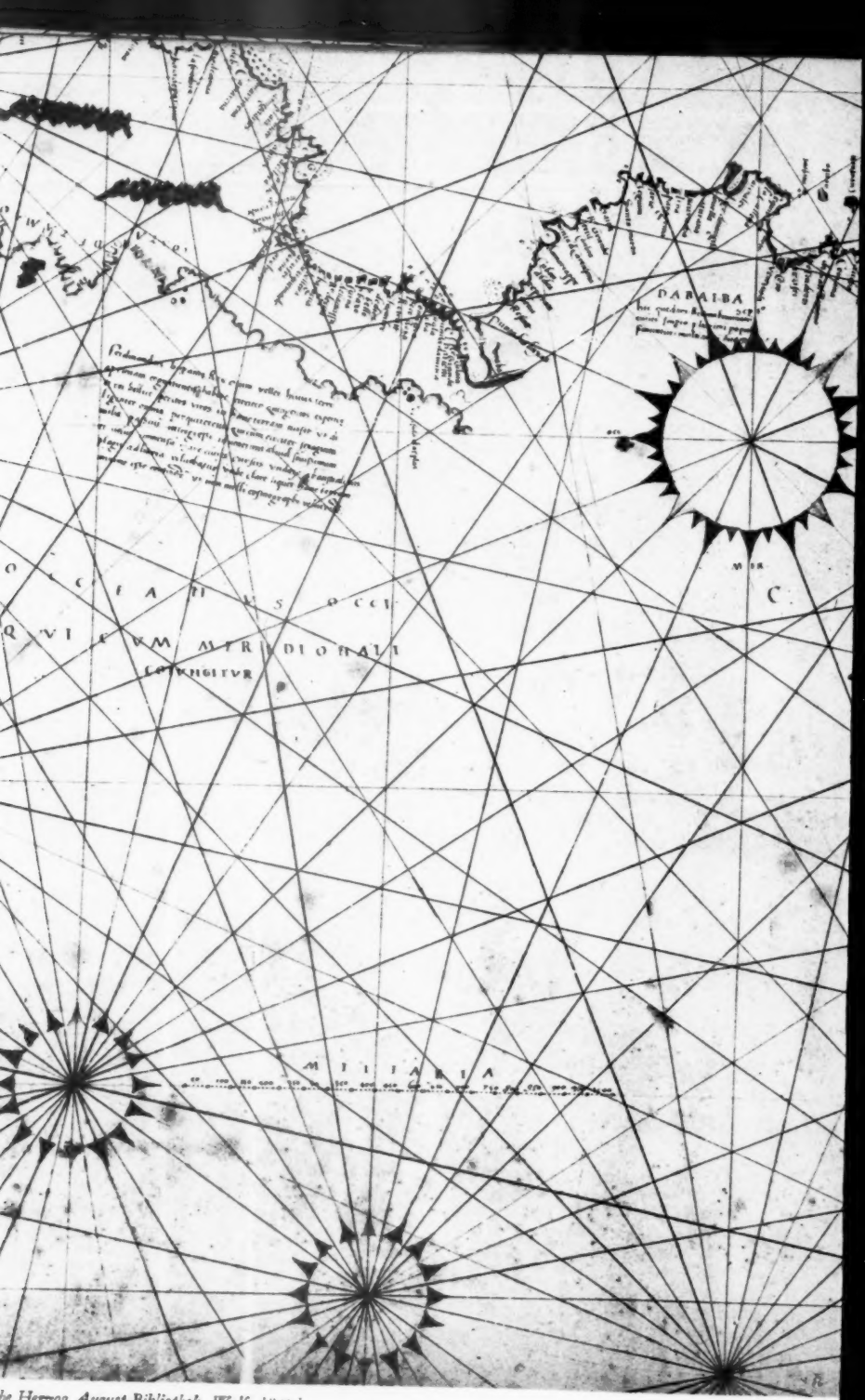




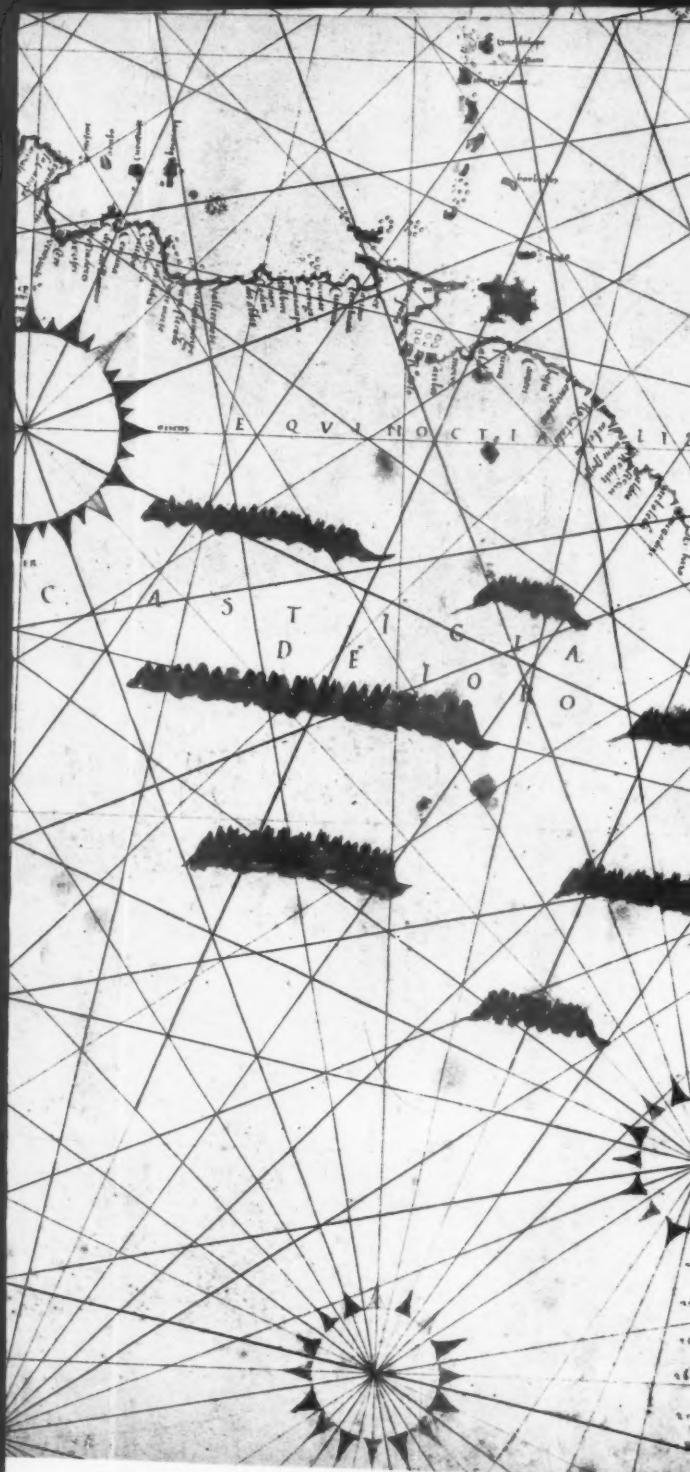




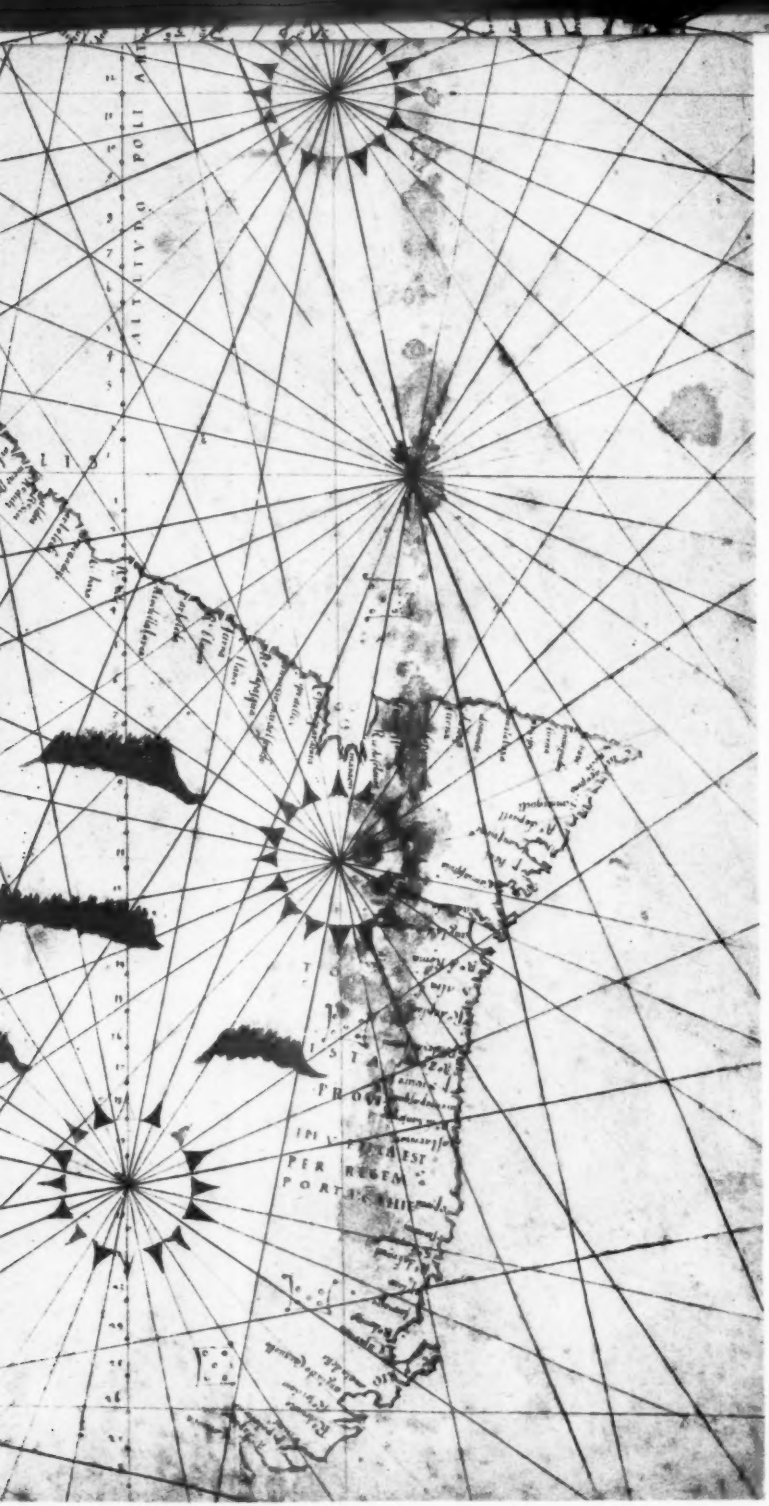
eproduced by the Royal Geographical Society by kind permission of the Director of the Herzog A



he Herzog August-Bibliothek, Wolfenbüttel.



PORTOLA



PORTOLAN CHART OF THE NEW WORLD, A.D. 1519